AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Central District of California on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
8:23-cv-1065	6/15/2023	Central District of California

PLAINTIFF	DEFENDANT
BELL NORTHERN RESEARCH, LLC	QUALCOMM INC., et al.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US RE 48,629 E	7/6/2021	Bell Northern Research LLC
2	US 8,416,862 B2	4/9/2013	Bell Northern Research LLC
3	US 7,564,914 B2	7/21/2009	Bell Northern Research LLC
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	**Mail Stop 8** **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court EASTERN DISTRICT OF TEXAS on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT EASTERN DISTRICT OF TEXAS
PLAINTIFF BELL NORTHERN RESEARCH, LLC		DEFENDANT ASUSTEK COMPUTER INC. and ASUS COMPUTER INTERNATIONAL

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	RE 48,629	7/6/2021	Bell Northern Research, LLC
2	8,416,862	4/9/2013	Bell Northern Research LLC
3	7,564,914	4/9/2013	Bell Northern Research LLC
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court WESTERN DISTRICT OF TEXAS on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
1:23-cv-00633	6/2/2023	WESTERN DISTRICT OF TEXAS

PLAINTIFF	DEFENDANT
BELL NORTHERN RESEARCH, LLC	NXP SEMICONDUCTORS, N.V.; NXP, B.V.; and NXP USA, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US RE 48,629	7/6/2021	Bell Northern Research, LLC
2	US 8,416,862	4/9/2013	Bell Northern Research, LLC
3	US 7,564,914	7/21/2009	Bell Northern Research, LLC
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court WESTERN DISTRICT OF TEXAS on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
1:23-cv-00633	6/2/2023	WESTERN DISTRICT OF TEXAS

PLAINTIFF	DEFENDANT
BELL NORTHERN RESEARCH, LLC	NXP SEMICONDUCTORS, N.V.; NXP, B.V.; and NXP USA, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US RE 48,629	7/6/2021	Bell Northern Research, LLC
2	US 8,416,862	4/9/2013	Bell Northern Research, LLC
3	US 7,564,914	7/21/2009	Bell Northern Research, LLC
4			
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Philip J. Devlin		06/06/2023

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Central District of Californiaa on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:21-cv-7323	9/13/2021	Central District of Californiaa

PLAINTIFF	DEFENDANT
BELL NORTHERN RESEARCH, LLC	TCL TECHNOLOGY GROUP CORPORATION, et al

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	U.S. 8,204,554	6/19/2012	BELL NORTHERN RESEARCH, LLC
2	U.S. 7,319,889	1/15/2008	BELL NORTHERN RESEARCH, LLC
3	RE 48,629	7/6/2021	BELL NORTHERN RESEARCH, LLC
4	U.S. 8,416,862	4/9/2013	BELL NORTHERN RESEARCH, LLC
5	U.S. 7,957,450	6/7/2011	BELL NORTHERN RESEARCH, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
Order on Stipulation of Dismissal With Prejudice filed 5/19/2022.

CLERK	(BY) DEPUTY CLERK	DATE
KIRY K. GRAY	G. Kami	5/20/2022

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Central District of Californiaa on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:21-cv-7323	9/13/2021	Central District of Californiaa

PLAINTIFF	DEFENDANT
BELL NORTHERN RESEARCH, LLC	TCL TECHNOLOGY GROUP CORPORATION, et al

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	U.S. 6,941,156	9/6/2005	BELL NORTHERN RESEARCH, LLC
2	U.S. 6,696,941	2/24/2004	BELL NORTHERN RESEARCH, LLC
3	U.S. 6,963,129	11/8/2005	BELL NORTHERN RESEARCH, LLC
4	U.S. 6,858,930	2/22/2005	BELL NORTHERN RESEARCH, LLC
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

TO:	**Mail Stop 8** **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Central District of Californiaa on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:21-cv-7323	9/13/2021	Central District of Californiaa

PLAINTIFF	DEFENDANT
BELL NORTHERN RESEARCH, LLC	TCL TECHNOLOGY GROUP CORPORATION, et al

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	U.S. 8,204,554	6/19/2012	BELL NORTHERN RESEARCH, LLC
2	U.S. 7,319,889	1/15/2008	BELL NORTHERN RESEARCH, LLC
3	RE 48,629	7/6/2021	BELL NORTHERN RESEARCH, LLC
4	U.S. 8,416,862	4/9/2013	BELL NORTHERN RESEARCH, LLC
5	U.S. 7,957,450	6/7/2011	BELL NORTHERN RESEARCH, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Central District of Californiaa on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:21-cv-7323	9/13/2021	Central District of Californiaa

PLAINTIFF	DEFENDANT
BELL NORTHERN RESEARCH, LLC	TCL TECHNOLOGY GROUP CORPORATION, et al

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	U.S. 6,941,156	9/6/2005	BELL NORTHERN RESEARCH, LLC
2	U.S. 6,696,941	2/24/2004	BELL NORTHERN RESEARCH, LLC
3	U.S. 6,963,129	11/8/2005	BELL NORTHERN RESEARCH, LLC
4	U.S. 6,858,930	2/22/2005	BELL NORTHERN RESEARCH, LLC
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

To:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313–1450	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Southern District of California on the following: **_X_** Patents or ___ Trademarks:

DOCKET NO. 3:21–cv–1598–CAB–BLM	**DATE FILED** 9/13/21	**US District Court** Southern District of California San Diego, CA
PLAINTIFF TCL Industries Holdings Co., Ltd. , et al.		DEFENDANT Bell Northern Research, LLC
PATENT OR TRADEMARK NO.	**PATENT OR TRADEMARK NO.**	**PATENT OR TRADEMARK NO.**
1. RE 48,629	**6.** 8,396,072	**11.** 6,963,129
2. 8,416,862	**7.** 7,319,889	**12.**
3. 7,957,450	**8.** 8,204,554	**13.**
4. 7,039,435	**9.** 6,696,941	**14.**
5. 6,941,156	**10.** 6,858,930	**15.**

In the above–entitled case, the following patents(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY __ Amendment __ Answer __ Cross Bill __ Other Pleading	
PATENT OR TRADEMARK NO.	**PATENT OR TRADEMARK NO.**	**PATENT OR TRADEMARK NO.**
1.	**6.**	**11.**
2.	**7.**	**12.**
3.	**8.**	**13.**
4.	**9.**	**14.**
5.	**10.**	**15.**

In the above–entitled case, the following decision has been rendered or judgment issued:

DECISION/JUDGMENT	Notice of Voluntary Dismissal

CLERK John Morrill	(BY) DEPUTY CLERK R. Chapman	DATE 1/7/2022

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-847	8/13/2021	Western District of Texas

PLAINTIFF	DEFENDANT
BELL NORTHERN RESEARCH, LLC	LENOVO GROUP LTD., LENOVO (UNITED STATES), INC., and MOTOROLA MOBILITY, LLC

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US RE48,629	7/6/2021	BELL NORTHERN RESEARCH, LLC
2	US 8,396,072	3/12/2013	BELL NORTHERN RESEARCH, LLC
3	US 8,792,432	7/29/2014	BELL NORTHERN RESEARCH, LLC
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
02/11/2022 - Order Dismissing Case.

CLERK	(BY) DEPUTY CLERK	DATE
Jeannette J. Clack	Jennifer Clark	02/11/2022

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-941	9/10/2021	Western District of Texas

PLAINTIFF	DEFENDANT
Bell Northern Research, LLC	Commscope Holding Company, Inc., et al.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US RE48,629	7/6/2021	Bell Northern Research, LLC
2	US 6,858,930 B2	2/22/2005	Bell Northern Research, LLC
3	US 6,963,129 B1	11/8/2005	Bell Northern Research, LLC
4	US 7,564,914 B2	7/21/2009	Bell Northern Research, LLC
5	US 8,416,862 B2	4/9/2013	Bell Northern Research, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
1/26/2021 ORDER OF DISMISSAL WITH PREJUDICE (Document 18)

CLERK	(BY) DEPUTY CLERK	DATE
Jeannette J. Clack	J. Rivera	01/27/2022

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas - Waco Division on the following

☑ Trademarks or ☐ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-833	8/11/2021	Western District of Texas - Waco Division

PLAINTIFF	DEFENDANT
Bell Northern Research, LLC	Apple Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,204,554	6/19/2012	Bell Northern Research, LLC
2	7,319,889	1/15/2008	Bell Northern Research, LLC
3	RE 48,629	7/6/2021	Bell Northern Research, LLC
4	8,416,862	4/9/2013	Bell Northern Research, LLC
5	7,957,450	6/7/2011	Bell Northern Research, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading		
	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above---entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
1/20/2022 ORDER OF DISMISSAL WITH PREJUDICE (document 29)

CLERK	(BY) DEPUTY CLERK	DATE
Jeannette J. Clack	L. Rivera	01/20/2022

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
6 - 7,957,450	6/7/2011	Bell Northern Research, LLC
7 - 6,963,129	11/8/2005	Bell Northern Research, LLC
8 - 6,858,930	2/22/2005	Bell Northern Research, LLC
9 - 7,039,435	5/2/2006	Bell Northern Research, LLC
10 - 8,396,072	3/12/2013	Bell Northern Research, LLC

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-909	9/1/2021	Western District of Texas

PLAINTIFF	DEFENDANT
BELL NORTHERN RESEARCH, LLC	DELL TECHNOLOGIES INC. AND DELL INC.,

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US RE48,629	7/6/2021	BELL NORTHERN RESEARCH, LLC
2	US 8,416,862	4/9/2013	BELL NORTHERN RESEARCH, LLC
3	US 7,564,914	7/21/2009	BELL NORTHERN RESEARCH, LLC
4	US 6,963,129	11/8/2005	BELL NORTHERN RESEARCH, LLC
5	US 6,858,930	2/22/2005	BELL NORTHERN RESEARCH, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
1/18/2022 ORDER GRANTING Joint Motion to Dismiss (Document 24)

CLERK	(BY) DEPUTY CLERK	DATE
Jeannette J. Clack	J. Rivera	01/18/2022

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-941	9/10/2021	Western District of Texas

PLAINTIFF	DEFENDANT
Bell Northern Research, LLC	Commscope Holding Company, Inc., et al.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US RE48,629	7/6/2021	Bell Northern Research, LLC
2	US 6,858,930 B2	2/22/2005	Bell Northern Research, LLC
3	US 6,963,129 B1	11/8/2005	Bell Northern Research, LLC
4	US 7,564,914 B2	7/21/2009	Bell Northern Research, LLC
5	US 8,416,862 B2	4/9/2013	Bell Northern Research, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-939	9/10/2021	Western District of Texas

PLAINTIFF	DEFENDANT
Bell Northern Research, LLC	HP, Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US RE48,629	7/6/2021	Bell Northern Research, LLC
2	US 6,858,930 B2	2/22/2005	Bell Northern Research, LLC
3	US 6,963,129 B1	11/8/2005	Bell Northern Research, LLC
4	US 7,564,914 B2	7/21/2009	Bell Northern Research, LLC
5	US 8,416,862 B2	4/9/2013	Bell Northern Research, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-909	9/1/2021	Western District of Texas

PLAINTIFF	DEFENDANT
BELL NORTHERN RESEARCH, LLC	DELL TECHNOLOGIES INC. AND DELL INC.,

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US RE48,629	7/6/2021	BELL NORTHERN RESEARCH, LLC
2	US 8,416,862	4/9/2013	BELL NORTHERN RESEARCH, LLC
3	US 7,564,914	7/21/2009	BELL NORTHERN RESEARCH, LLC
4	US 6,963,129	11/8/2005	BELL NORTHERN RESEARCH, LLC
5	US 6,858,930	2/22/2005	BELL NORTHERN RESEARCH, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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3		
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5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas - Waco Division on the following

☑ Trademarks or ☐ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-833	8/11/2021	Western District of Texas - Waco Division

PLAINTIFF	DEFENDANT
Bell Northern Research, LLC	Apple Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,204,554	6/19/2012	Bell Northern Research, LLC
2	7,319,889	1/15/2008	Bell Northern Research, LLC
3	RE 48,629	7/6/2021	Bell Northern Research, LLC
4	8,416,862	4/9/2013	Bell Northern Research, LLC
5	7,957,450	6/7/2011	Bell Northern Research, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
6 - 7,957,450	6/7/2011	Bell Northern Research, LLC
7 - 6,963,129	11/8/2005	Bell Northern Research, LLC
8 - 6,858,930	2/22/2005	Bell Northern Research, LLC
9 - 7,039,435	5/2/2006	Bell Northern Research, LLC
10 - 8,396,072	3/12/2013	Bell Northern Research, LLC

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/686,468	07/06/2021	RE48629	1382.001RE	2785

22186 7590 06/16/2021

MENDELSOHN DUNLEAVY, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 910
PHILADELPHIA, PA 19102

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Extension or Adjustment under 35 U.S.C. 154 (b)

A reissue patent is for "the unexpired part of the term of the original patent." See 35 U.S.C. 251. Accordingly, the above-identified reissue application is not eligible for Patent Term Extension or Adjustment under 35 U.S.C. 154(b).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Bell Northern Research, LLC, Chicago, IL, Assignee (with 37 CFR 1.172 Interest);
Jason Alexander Trachewsky, Menlo Park, CA;
Rajendra T. Moorti, Mountain View, CA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. 1382.001RE

In re application of: Jason Alexander Trachewsky and Rajendra T. Moorti

Serial No.:	16/686,468	Group Art Unit:	3992
Filed:	11/18/19	Examiner:	Mark Sager
		Phone No.:	571-272-4454

For: Backward-Compatible Long Training Sequences for Wireless Communication Networks

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

The Notice of Allowability mailed on 05/17/21 contains an Examiner's Statement of Reasons for Allowance.

The Statement contains language that attempts to characterize the claimed subject matter. The Applicant submits, however, that the language in the Statement does not accurately characterize independent claim 1. For example, claim 1 recites: "the optimal extended long training sequence is carried by a greater number of subcarriers than a standard wireless networking configuration for an Orthogonal Frequency Division Multiplexing scheme." The Statement states: "the extended and optimal long train sequences are stored on multiple sub-carriers than standard configuration for orthogonal frequency division multiplexing scheme."

In general, to the extent that the Statement differs from the language of claim 1, the Applicant rejects any narrowing or limitations that might possibly result from such differences.

Furthermore, the Statement cites only a portion of the claim language from claim 1. The Applicant submits that claim 1 recites additional language not cited by the Examiner. The Applicant does not necessarily admit that the independent claims are allowable solely on the basis of the limited language cited by the Examiner.

For each of these reasons individually and for all these reasons collectively, the Applicant objects to the Statement.

Respectfully submitted,

Date: 05/21/2021
Customer No. 22186
Mendelsohn Dunleavy, P.C.
1500 John F. Kennedy Blvd., Suite 910
Philadelphia, Pennsylvania 19102

/Steve Mendelsohn/
Steve Mendelsohn
Registration No. 35,951
Attorney for Applicant
(215) 557-6657 (phone)
(215) 557-8477 (fax)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

22186 7590 05/17/2021
MENDELSOHN DUNLEAVY, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 910
PHILADELPHIA, PA 19102

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

Eri Yoneda	(Typed or printed name)
/Eri Yoneda/	(Signature)
May 21, 2021	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/686,468	11/18/2019	Jason Alexander Trachewsky	1382.001RE	2785

TITLE OF INVENTION: Backward-Compatible Long Training Sequences for Wireless Communication Networks

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	08/17/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
SAGER, MARK ALAN	3992	370-208000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Mendelsohn Dunleavy, P.C.
2 Steve Mendelsohn
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Bell Northern Research, LLC

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Chicago, IL

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 50-0782

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Steve Mendelsohn/ Date May 21, 2021

Typed or printed name Steve Mendelsohn Registration No. 35,951

Electronic Patent Application Fee Transmittal

Application Number:	16686468
Filing Date:	18-Nov-2019
Title of Invention:	Backward-Compatible Long Training Sequences for Wireless Communication Networks
First Named Inventor/Applicant Name:	Jason Alexander Trachewsky
Filer:	Steve Mendelsohn/Eri Yoneda
Attorney Docket Number:	1382.001RE

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
REISSUE ISSUE FEE	1511	1	1200	1200

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1200**

Electronic Acknowledgement Receipt

EFS ID:	42786521
Application Number:	16686468
International Application Number:	
Confirmation Number:	2785
Title of Invention:	Backward-Compatible Long Training Sequences for Wireless Communication Networks
First Named Inventor/Applicant Name:	Jason Alexander Trachewsky
Customer Number:	22186
Filer:	Steve Mendelsohn/Eri Yoneda
Filer Authorized By:	Steve Mendelsohn
Attorney Docket Number:	1382.001RE
Receipt Date:	21-MAY-2021
Filing Date:	18-NOV-2019
Time Stamp:	12:54:09
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1200
RAM confirmation Number	E20215KC56192972
Deposit Account	500782
Authorized User	Eri Yoneda
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.19 (Document supply fees) 37 CFR 1.20 (Post Issuance fees)	

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	1382-001RE_Comments_on_Statement_of_Reasons_for_Allowance.pdf	19772 b4d26e54a5afed24ae9fa52a0640936f541fd903	no	1
Warnings:					
Information:					
2	Issue Fee Payment (PTO-85B)	1382-001RE_Issue_Fee_Transmittal.pdf	183762 b7dd2ef58e2dc0f0951574cd1d7b8c7f7b86248d	no	1
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30885 a4e0deefecbbf0554b7b044dc5ec1f1507349cd6	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	234419		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

22186 7590 05/17/2021
MENDELSOHN DUNLEAVY, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 910
PHILADELPHIA, PA 19102

EXAMINER
SAGER, MARK ALAN

ART UNIT	PAPER NUMBER
3992	

DATE MAILED: 05/17/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/686,468	11/18/2019	Jason Alexander Trachewsky	1382.001RE	2785

TITLE OF INVENTION: Backward-Compatible Long Training Sequences for Wireless Communication Networks

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	08/17/2021

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

22186 7590 05/17/2021
MENDELSOHN DUNLEAVY, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 910
PHILADELPHIA, PA 19102

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/686,468	11/18/2019	Jason Alexander Trachewsky	1382.001RE	2785

TITLE OF INVENTION: Backward-Compatible Long Training Sequences for Wireless Communication Networks

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	08/17/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
SAGER, MARK ALAN	3992	370-208000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/686,468	11/18/2019	Jason Alexander Trachewsky	1382.001RE	2785

22186 7590 05/17/2021

MENDELSOHN DUNLEAVY, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 910
PHILADELPHIA, PA 19102

EXAMINER	
SAGER, MARK ALAN	
ART UNIT	PAPER NUMBER
3992	

DATE MAILED: 05/17/2021

Determination of Patent Term Extension or Adjustment under 35 U.S.C. 154 (b)

A reissue patent is for "the unexpired part of the term of the original patent." See 35 U.S.C. 251. Accordingly, the above-identified reissue application is not eligible for Patent Term Extension or Adjustment under 35 U.S.C. 154(b).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 16/686,468	Applicant(s) Trachewsky et al.	
	Examiner MARK A SAGER	Art Unit 3992	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 4/22/2021.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1,4 and 8-30 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☑ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/Mark Sager/
Primary Examiner, Art Unit 3992

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

2. This action is in response to papers filed April 22, 2021 that submits a revised declaration, amends the specification, and amends claims 1, 4, 9-10 and 19 and cancels claims 2, 3 and 5-7 that based on these recent changes now regards a **narrowing** reissue application. Claims 1, 4, 8-30 are pending with claims 21-30 being new.

3. To clarify the record, the preliminary amendment received Nov. 18, 2019 is not entered based on remark by applicant that states two amendments to specification were withdrawn; thus, indicating preference of the recent amendment, received April 22, 2021, to replace the preliminary amendment, received Nov. 18, 2019. The applicant remark, on page 14 in recent amendment received April 22, 2021, states regarding "the paragraph beginning at column 2, line 59… the Applicant has withdrawn that amendment to the specification" and states regarding "the paragraph beginning at column 3, line 4… the Applicant has withdrawn that amendment to the specification." Those two noted amendments to the specification in the preliminary amendment are not included in the recent amendment such that those associated paragraphs in the specification remain as original text and similarly claims 14 and 16 are original text by recent amendment and remarks therein.

4. For reissue applications filed before September 16, 2012, all references to 35 U.S.C. 251 and 37 CFR 1.172, 1.175, and 3.73 are to the law and rules in effect on September 15, 2012. Where specifically designated, these are "pre-AIA" provisions. For reissue applications filed on or after September 16, 2012, all references to 35 U.S.C. 251 and 37 CFR 1.172, 1.175, and 3.73 are to the current provisions.

Prior or Concurrent Proceedings

5. Applicant is reminded of the continuing obligation under 37 CFR 1.178(b), to timely apprise the Office of any prior or concurrent proceeding in which the 7990842 patent is or was involved. These proceedings would include interferences, reissues, reexaminations, and litigation.

Information Material to Patentability

6. Applicant is further reminded of the continuing obligation under 37 CFR 1.56, to timely apprise the Office of any information which is material to patentability of the claims under consideration in this reissue application.

These obligations rest with each individual associated with the filing and prosecution of this application for reissue. See also MPEP §§ 1404, 1442.01 and 1442.04.

Response to Arguments

7. Applicant's arguments, see pages 10-11, filed April 22, 2021, with respect to objection to drawings have been fully considered and are persuasive. The objection of drawings has been withdrawn.

8. Applicant's arguments, see pages 11-13, filed April 22, 2021, with respect to compliance with amendment under 37 CFR 1.173 have been fully considered and are persuasive. The objection of amendment has been withdrawn.

9. Applicant's arguments, see pages 13-15, filed April 22, 2021, with respect to objection to specification for entering new matter have been fully considered and are persuasive. The objection of specification has been withdrawn.

10. Applicant's arguments, see page 15, filed April 22, 2021, with respect to lack of written description under 35 USC 112 (pre-AIA), first paragraph with rejection of clams 1, 4, 8-21 and

23-30 have been fully considered and are persuasive. The rejection of claims 1, 4, 8-21, 23-30 has been withdrawn.

11. Applicant's arguments, see pages 15-16, filed April 22, 2021, with respect to indefiniteness under 35 USC 112 (pre-AIA) second paragraph have been fully considered and are persuasive. The rejection of claims 10 and 23 has been withdrawn.

12. Applicant's arguments, see page 16, filed April 22, 2021, with respect to improper broadening in reissue beyond two year statutory period under 35 USC 251 have been fully considered and are persuasive. The rejection of claims 1, 4, 8-21, and 24-30 has been withdrawn.

13. Applicant's arguments, see page 16, filed April 22, 2021, with respect to defective declaration under 35 USC 251 have been fully considered and are persuasive. The objection of declaration and rejection of claims 1, 4, 8-30 has been withdrawn.

Allowable Subject Matter

14. Claims 1, 4, and 8-30 are allowed.

15. The following is an examiner's statement of reasons for allowance: the reasons for allowance as stated in action mailed 6/22/2009 in parent application 11/188771 is relied on herein but is revised for claim amendments herein:

> "the prior art fails to teach a signal generator that generates expanded long train sequence and inverse fast Fourier transform (IFFT) module processes the extended sequence and produces optimal extended long train sequence with minimal peak-to-average power ratio whereby the extended and optimal long train sequences are stored on multiple sub-carriers than standard configuration for orthogonal frequency division multiplexing scheme" as now recited in claim 1 and its associated dependent claims.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue

fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Sager whose telephone number is (571)272-4454. The examiner can normally be reached on M-Th, 7:30am-4pm, EST.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexander Kosowski can be reached on (571)272-3744. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark Sager/
Primary Examiner, Art Unit 3992

Conferee(s):

/FRED O FERRIS III/
Reexamination Specialist, Art Unit 3992

/ALEXANDER J KOSOWSKI/
Supervisory Patent Examiner, Art Unit 3992

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/686,468	Trachewsky et al.
	Examiner	Art Unit
	MARK A SAGER	3992

CPC - Searched*		
Symbol	Date	Examiner
H04L27/2613, H04L27/262, H04L5/0048, H04L25/0226, H04B2201/70701, H04B2201/70706	03/11/2021	ms

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Lit Search	02/13/2020	ms
reviewed 7990842 and 7646703 file history	03/08/2021	ms
PE2E Search	03/10/2021	ms
updated PE2E Search	05/05/2021	ms

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
H04L	27/2613, 27/262, 5/0048, 25/0226	05/05/2021	ms
H04B	2201/70701, 2201/70706	05/05/2021	ms

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/686,468	Trachewsky et al.
	Examiner	**Art Unit**
	MARK A SAGER	3992

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/10/2021	05/04/2021							
	1	✓	=							
	2	-	-							
	3	-	-							
	4	✓	=							
	5	-	-							
	6	-	-							
	7	-	-							
	8	✓	=							
	9	✓	=							
	10	✓	=							
	11	✓	=							
	12	✓	=							
	13	✓	=							
	14	✓	=							
	15	✓	=							
	16	✓	=							
	17	✓	=							
	18	✓	=							
	19	✓	=							
	20	✓	=							
	21	✓	=							
	22	✓	=							
	23	✓	=							
	24	✓	=							
	25	✓	=							
	26	✓	=							
	27	✓	=							
	28	✓	=							
	29	✓	=							
	30	✓	=							

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/686,468	Trachewsky et al.
	Examiner	**Art Unit**
	MARK A SAGER	3992

CPC						
Symbol					**Type**	**Version**
H04L	/	27	/	2613	F	2013-01-01
H04L	/	27	/	262	I	2013-01-01
H04B	/	2201	/	70701	A	2013-01-01
H04L	/	5	/	0048	A	2013-01-01
H04B	/	2201	/	70706	A	2013-01-01
H04L	/	25	/	0226	A	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	25	
/MARK SAGER/ Primary Examiner, Art Unit 3992	06 May 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

U.S. Patent and Trademark Office

Part of Paper No.: 20210506

NXP - Exhibit 1004 - Page 38

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/686,468	Trachewsky et al.
	Examiner	Art Unit
	MARK A SAGER	3992

INTERNATIONAL CLASSIFICATION					
CLAIMED					
H04L	/	27	/	262	

NON-CLAIMED					
	/		/		

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	25	
/MARK SAGER/ Primary Examiner, Art Unit 3992	06 May 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

U.S. Patent and Trademark Office

Part of Paper No.: 20210506

NXP - Exhibit 1004 - Page 39

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/686,468	Trachewsky et al.
	Examiner	Art Unit
	MARK A SAGER	3992

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		10		19		28								
	2		11		20		29								
	3		12		21		30								
	4		13		22										
	5		14		23										
	6		15		24										
	7		16		25										
	8		17		26										
	9		18		27										

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	25	
/MARK SAGER/ Primary Examiner, Art Unit 3992	06 May 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

U.S. Patent and Trademark Office

Part of Paper No.: 20210506

NXP - Exhibit 1004 - Page 40

United States Patent And Trademark Office	**Application No.**	**Art Unit**
	16/686,468	3992
Reissue Terminal Disclaimer Review Form	**Examiner**	**AIA Status**
	MARK A SAGER	No

Original Patent Number of Patent to be Reissued is: 7990842	**The Maintenance fee status is:** ◉ up to date ○ not up to date (Consult with SPRS)

Is there a terminal disclaimer filed and accepted during the prosecution of (i) the current reissue application, (ii) the underlying patent, and/or (iii) reexamination proceeding(s) of the underlying patent?

◉ NO
○ YES (Complete the rest of the form)

The reissue patent is subject to Terminal Disclaimer(s) that was/were:

☐ filed and accepted (DISQ or DISQ.E.FILE) during the prosecution of the current reissue application. (Enter terminal disclaimer(s) filing date(s) below).

1. _____ 2. _____ 3. _____

The underlying patent of the current reissue application is subject to Terminal DIsclaimer(s) that was/were:

☑ accepted (DISQ or DISQ.E.FILE) and of record in the prosecution of the underlying patent and/or reexamination procceeding(s) of the underlying patent. (Enter application/control no(s) and terminal disclaimer(s) filing date(s) below).

1. 12/684650 31 March 2011 2. _____ _____ 3. _____ _____

Bibliographic Data

Application No: 16/686,468

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /MARK SAGER/ Examiner's Signature | Initials

Title: Backward-Compatible Long Training Sequences for Wireless Communication Networks

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FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/18/2019	370	3992	1382.001RE
RULE			

APPLICANTS

Bell Northern Research, LLC, Chicago, IL, UNITED STATES

INVENTORS

Jason Alexander Trachewsky, Menlo Park, CA, UNITED STATES

Rajendra T. Moorti, Mountain View, CA, UNITED STATES

CONTINUING DATA

This application is a REI of 12684650 01/08/2010 PAT 7990842

12684650 is a CON of 11188771 07/26/2005 PAT 7646703

11188771 has PRO of 60634102 12/08/2004

11188771 has PRO of 60591104 07/27/2004

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

12/19/2019

STATE OR COUNTRY

UNITED STATES

ADDRESS

MENDELSOHN DUNLEAVY, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 910
PHILADELPHIA, PA 19102
UNITED STATES

FILING FEE RECEIVED

$3,660

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	2	("7990842" "7646703").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/09 08:01 AM
L2	10	("7203245" | "7254171" | "7394865" | "20040008803" | "20040264585" | "20050265219" | "20060209890" | "20060209892" | "20070002749" | "20070047671").pn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/03/09 09:52 AM
L3	2	("7990842" "7646703").PN. AND map$	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/09 09:56 AM
L4	2	("7990842" "7646703").PN. AND (processor monitor)	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/09 10:00 AM
L5	2	("7990842" "7646703").PN. AND (expanded extended)	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/09 02:54 PM
L6	2	("7990842" "7646703").PN. AND window$	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/09 02:57 PM
L7	2	("7990842" "7646703").PN. AND (receiver transmitter transceiver)	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/10 07:50 AM
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L9	5147759	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 AND @ad<=20040727 OR @ad<20041208	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/10 04:05 PM
L10	5147759	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 WITH (IFT inverse ADJ fourier) AND @ad<=20040727 OR @ad<20041208	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/10 04:06 PM
L11	5147759	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 WITH (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND @ad<=20040727 OR @ad<20041208	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/10 04:08 PM

L12	5147765	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 WITH (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND (orthogonal ADJ frequency OFDM) @ad<=20040727 OR @ad<20041208	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/10 04:09 PM
L13	0	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 WITH (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND (orthogonal ADJ frequency OFDM) AND (@ad<=20040727 OR @ad<20041208)	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/10 04:11 PM
L14	0	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 WITH (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND (orthogonal ADJ frequency OFDM) AND (@ad<=20040727 OR @ad<20041208)	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/10 04:12 PM
L15	0	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 WITH (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND (@ad<=20040727 OR @ad<20041208)	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/10 04:12 PM
L16	106	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 AND (@ad<=20040727 @ad<20041208)	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/10 04:12 PM
L17	0	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 WITH (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND (@ad<=20040727 @ad<20041208)	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/10 04:13 PM

L18	1195	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence AND (@ad<=20040727 @ad<20041208)	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/10 04:14 PM
L19	3	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 AND (IFT inverse ADJ fourier) AND (@ad<=20040727 @ad<20041208)	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/10 04:16 PM
L20	3	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 AND (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND (@ad<=20040727 @ad<20041208)	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/10 04:19 PM
L21	7152	(H04L27/2613).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/11 08:00 AM
L22	454	(H04L27/262).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/11 08:01 AM
L23	21308	(H04L5/0048).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/11 08:02 AM
L24	3519	(H04L25/0226).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/11 08:03 AM
L25	1704	(H04B2201/70701).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/11 08:03 AM
L26	479	(H04B2201/70706).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2021/03/11 08:04 AM
L27	0	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH (series serial sequence continuous) SAME generat$3 AND exactly ADJ "52" AND exactly ADJ "56" AND (legacy standard)	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/05 05:56 AM
L28	0	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH (series serial sequence continuous) AND exactly ADJ "52" AND exactly ADJ "56" AND (legacy standard)	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/05 05:56 AM
L29	1	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH (series serial sequence continuous) AND (only exactly) WITH ("52" "56") WITH sub$1carrier AND (legacy standard)	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/05 05:59 AM

L30	0	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH (continuous series sequence) WITH generat$3 WITH (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND ((orthogonal ADJ frequency) OFDM) AND (exactly only) ADJ ("52" "56") AND @ad<="20040727"	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/05 06:09 AM
L31	0	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH (continuous series sequence) WITH generat$3 WITH (IFT (inverse ADJ fourier)) AND (legacy standard) AND (peak minimal minimum average ratio) AND ((orthogonal ADJ frequency) OFDM) AND (exactly only) ADJ ("52" "56") AND @ad<="20040727"	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/05 06:10 AM
L32	0	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH (continuous series sequence) WITH generat$3 WITH (IFT (inverse ADJ fourier)) AND (legacy standard) AND (peak minimal minimum average ratio) AND ((orthogonal ADJ frequency) OFDM) AND @ad<="20040727"	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/05 06:11 AM
L33	6	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH (continuous series sequence) WITH generat$3 WITH (IFT (inverse ADJ fourier)) AND (legacy standard) AND (peak minimal minimum average ratio) AND ((orthogonal ADJ frequency) OFDM)	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/05 06:12 AM

L34	7	("7203245" | "7254171" | "7394865" | "20040008803" | "20040264585" | "20050265219" | "20060209890" | "20060209892" | "20070002749" | "20070047671").pn. AND (PGPB | USPT | USOC).dbnm. AND (expand$3 extend$3 elong$5 long$4) WITH train$3 WITH (series continuous sequence) AND (IFT (inverse WITH fourier WITH transform))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/05/05 07:59 AM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	7266	(H04L27/2613).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/05 06:26 AM
N2	457	(H04L27/262).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/05 06:26 AM
N3	21903	(H04L5/0048).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/05 06:27 AM
N4	3586	(H04L25/0226).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/05 06:28 AM
N5	1704	(H04B2201/70701).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/05 06:28 AM
N6	481	(H04B2201/70706).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/05 06:28 AM

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/686,468	11/18/2019	Jason Alexander Trachewsky	1382.001RE	2785

22186 7590 04/23/2021

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EXAMINER	
SAGER, MARK ALAN	

ART UNIT	PAPER NUMBER
3992	

NOTIFICATION DATE	DELIVERY MODE
04/23/2021	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docketing@mendelip.com

Applicant-Initiated Interview Summary	**Application No.** 16/686,468	**Applicant(s)** Trachewsky et al.		
	Examiner MARK A SAGER	**Art Unit** 3992	**AIA (First Inventor to File) Status** No	**Page** 1 of 2

All Participants (applicant, applicants representative, PTO personnel)	**Title**	**Type**
MARK A SAGER	Primary Examiner	Telephonic
Alexander Kosowski	SPE	
Steve Medelsohn (35951)	Attorney	

Date of Interview: 19 April 2021

Issues Discussed:

35 U.S.C. 112

Attached proposed claim amendment asserted by Applicant to address lack of written description/new matter raised in NF. Examiners noted this regards a reissue application rather than an initial filing of a national application. No agreement reached.

Proposed Amendment(s)

Attached amendments to claims and specification alleged by Applicant to address 1.173, new matter, 112(1), 112(2) and defective declaration broadening beyond 2 years raised in NF. Examiners noted this regards a reissue application rather than an initial filing of a national application. No agreement reached.

Drawings

Attached annotated Figs 2 and 3 were informational in discussion of 112 issues raised in NF. No agreement reached.

☑ Attachment

/MARK SAGER/ Primary Examiner, Art Unit 3992	/A.J.K/ Supervisory Patent Examiner, Art Unit 3992

Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Applicant-Initiated Interview Summary	Application No. 16/686,468	Applicant(s) Trachewsky et al.		
	Examiner MARK A SAGER	Art Unit 3992	AIA (First Inventor to File) Status No	Page 2 of 2

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

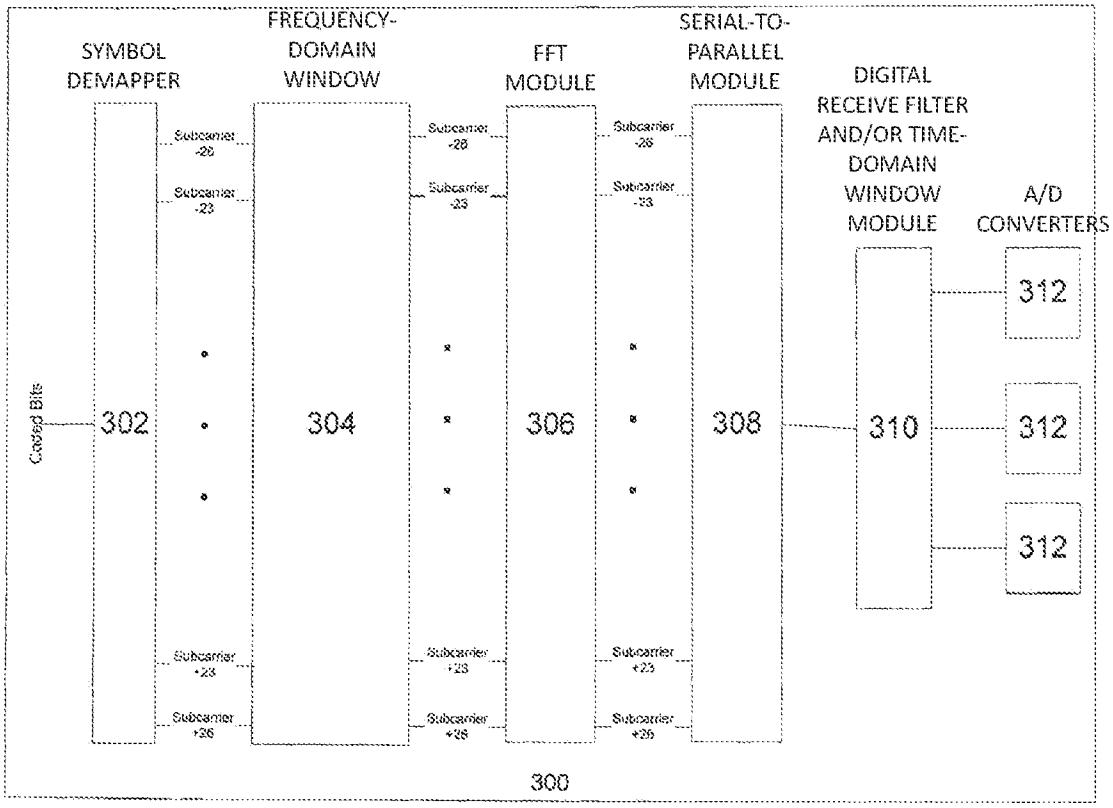

SYMBOL DEMAPPER
FREQUENCY-DOMAIN WINDOW
FFT MODULE
SERIAL-TO-PARALLEL MODULE
DIGITAL RECEIVE FILTER AND/OR TIME-DOMAIN WINDOW MODULE
A/D CONVERTERS
Coded Bits
302
304
306
308
310
312
312
312
300

Figure 3

ANNOTATED CLAIMS

1. (previously amended, newly amended) A wireless communications device, comprising:

a signal generator that generates an extended long training sequence; and

an Inverse Fourier Transformer operatively coupled to the signal generator,

wherein the Inverse Fourier Transformer processes the extended long training sequence from the signal generator and provides an optimal extended long training sequence with a minimal peak-to-average ratio, and

wherein at least the optimal extended long training sequence is carried by a greater number of subcarriers than a ~~legacy~~ {standard} wireless networking ~~protocol standard~~ configuration for an Orthogonal Frequency Division Multiplexing scheme,

wherein, when only 56 active sub-carriers are used, the optimal extended long training sequence is carried by ~~exactly~~ the 56 active sub-carriers, and

wherein the optimal extended long training sequence is represented by encodings for indexed sub-carriers -28 to +28, excluding indexed sub-carrier 0 which is set to zero, as follows:

Sub-carrier	-28	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15
Encoding	+1	+1	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1
Sub-carrier	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
Encoding	+1	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1	+1
Sub-carrier	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Encoding	+1	-1	-1	+1	+1	-1	+1	-1	+1	-1	-1	-1	-1	-1
Sub-carrier	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Encoding	+1	+1	-1	-1	+1	-1	+1	-1	+1	+1	+1	+1	-1	-1

2-3. (canceled)

4. (previously amended, newly amended) The wireless communications device according to claim [2,] 1, wherein the {optimal extended long training sequence has a minimum} ~~minimal~~ peak-to-average power ratio {of} is 3.6 dB.

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5-7. (canceled)

8. (original) The wireless communications device according to claim 1, wherein a binary phase shift key encoding is used for each sub-carrier above the +26 indexed sub-carrier and below the −26 indexed sub-carrier.

9. (~~original~~newly amended) The wireless communications device according to claim 1, wherein the Inverse Fourier Transformer comprises ~~at least one of the following:~~ an Inverse Fast Fourier Transformer ~~and~~ or an Inverse Discrete Fourier Transformer.

10. (previously amended, newly amended) The wireless communications device according to claim 1, wherein the wireless communications device comprises one or more of the following: a personal digital assistant, a laptop computer, a personal computer, a processor, ~~a monitor,~~ and a cellular phone.

11. (original) The wireless communications device according to claim 1, wherein the wireless communications device comprises a wireless mobile communications device.

12. (original) The wireless communications device according to claim 1, wherein the wireless communications device comprises one or more of the following: an access point and a base station.

13. (original) The wireless communications device according to claim 1, wherein the wireless communications device is backwards compatible with legacy wireless local area network devices.

14. (previously amended, newly amended) The wireless communications device according to claim 1, wherein the optimal extended long training sequence is longer than a long training sequence used by a legacy wireless local area network device in accordance with ~~[a] the~~ legacy wireless networking protocol standard.

15. (original) The wireless communications device according to claim 14, wherein the legacy wireless local area network device uses the optimal extended long training sequence to estimate a carrier frequency offset even though the optimal extended long training sequence is longer than the long

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training sequence that is specified by the legacy wireless networking protocol standard.

16. (previously amended, newly amended) The wireless communications device according to claim 15, wherein the long training sequence that is specified by the legacy wireless networking protocol standard is maintained in {the extended long training sequence or} the optimal extended long training sequence.

17. (original) The wireless communications device according to claim 1, wherein the wireless communications device decreases power back-off.

18. (original) The wireless communications device according to claim 1, wherein the wireless communications device registers with one or more of the following: an access point and a base station.

19. (previously amended, newly amended) The wireless communications device according to claim 1, wherein {the extended long training sequence or} the optimal extended long training sequence is encoded using binary phase shift key encoding on each of the 56 active subcarriers.

20. (original) The wireless communications device according to claim 1, comprising:

a symbol mapper operatively coupled to the signal generator, wherein the symbol mapper receives coded bits and generates symbols for each of 64 subcarriers of an Orthogonal Frequency Division Multiplexing sequence.

21. (~~new~~previously added, newly amended) The wireless communications device according to claim 14, wherein the legacy wireless networking protocol standard for the Orthogonal Frequency Division Multiplexing scheme corresponds to ~~exactly~~ only 52 active subcarriers.

22. (~~new~~previously added) The wireless communications device according to claim 21, wherein, for a long training sequence of the legacy wireless networking protocol standard, the indexed sub-carrier 0 is set to zero and encodings for the indexed sub-carriers -26 to +26 excluding the indexed sub-carrier 0 are:

Sub-carrier	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14
Encoding	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1	+1

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Sub-carrier	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
Encoding	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1	+1
Sub-carrier	1	2	3	4	5	6	7	8	9	10	11	12	13
Encoding	+1	-1	-1	+1	+1	-1	+1	-1	+1	-1	-1	-1	-1
Sub-carrier	14	15	16	17	18	19	20	21	22	23	24	25	26
Encoding	-1	+1	+1	-1	-1	+1	-1	+1	-1	+1	+1	+1	+1

23. (~~new~~previously added, newly amended) The wireless communications device according to claim 22, wherein:

the Inverse Fourier Transformer comprises ~~at least one of the following:~~ an Inverse Fast Fourier Transformer ~~and~~ or an Inverse Discrete Fourier Transformer;

the wireless communications device comprises one or more of the following: a personal digital assistant, a laptop computer, a personal computer, a cellular phone, an access point, a processor, a ~~monitor~~ and a base station;

the wireless communications device is backwards compatible with the legacy wireless local area network device;

the legacy wireless local area network device uses the optimal extended long training sequence to estimate a carrier frequency offset even though the optimal extended long training sequence is longer than the long training sequence that is specified by the legacy wireless networking protocol standard;

the wireless communications device decreases power back-off;

~~the extended long training sequence or~~ the optimal extended long training sequence is encoded using binary phase shift key encoding on each of the 56 active subcarriers; and

the wireless communications device further comprises a symbol mapper operatively coupled to the signal generator, wherein the symbol mapper receives coded bits and generates symbols for each of 64 subcarriers of an Orthogonal Frequency Division Multiplexing sequence.

24. (~~new~~previously added) The wireless communications device according to claim 1, wherein at least one output of the Inverse Fourier Transformer is operatively coupled to at least one digital-to-analog converter.

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25. (~~new~~previously added, newly amended) The wireless communications device according to claim 1, wherein at least one output of the Inverse Fourier Transformer is operatively coupled to multiple digital-to-analog converters~~, each of which is coupled to a transmitter~~.

26. (~~new~~previously added) The wireless communications device according to claim 1, wherein an input of the signal generator is operatively coupled to a frequency-domain windower.

27. (~~new~~previously added) The wireless communications device according to claim 1, wherein an output of the Inverse Fourier Transformer is operatively coupled to a time-domain windower.

28. (~~new~~previously added) The wireless communications device according to claim 27, wherein an output of the time-domain windower is operatively coupled to at least one digital-to-analog converter.

29. (~~new~~previously added) The wireless communication device according to claim 1, wherein an output of the Inverse Fourier Transformer is operatively coupled to a digital transmit filter.

30. (~~new~~previously added) The wireless communications device according to claim 1, wherein an output of the Inverse Fourier Transformer is operatively coupled to a parallel-to-serial convertor.

SYMBOL MAPPER
FREQUENCY -DOMAIN WINDOW
SIGNAL GENERATING CIRCUIT
IFFT MODULE
PARALLEL-TO-SERIAL MODULE
DIGITAL TRANSMIT FILTER AND/OR TIME-DOMAIN WINDOW MODULE
D/A CONVERTERS
Coded Bits
202
204
205
206
208
210
212
212
212
Subcarrier -26
Subcarrier -25
Subcarrier +25
Subcarrier +26
200

Figure 2

From:	Steve Mendelsohn
To:	Sager, Mark
Cc:	eri@mendelip.com
Subject:	Serial No. 16/686,468 (MD ref 1382.001RE)
Date:	Monday, April 12, 2021 12:04:11 PM
Attachments:	image001.png Interview Agenda.pdf US7990842 (Trachewsky) annotated proposed claim amendments.pdf US7990842 (Trachewsky) FIG. 2 (annotated).pdf US7990842 (Trachewsky) FIG. 3 (annotated).pdf

Dear Examiner Sager,

Following up on our telephone conversation this morning, I am attaching an Interview Agenda, proposed claim amendments, and annotated FIGs. 2 and 3 for a telephonic interview. Please let me know which day and time listed in the Interview Agenda are good for you and your colleagues.

Thank you,

Steve Mendelsohn

Mendelsohn, P.C.

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Philadelphia, PA 19102
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. 1382.001RE

In re application of: Jason Alexander Trachewsky and Rajendra T. Moorti

Serial No.:	16/686,468	Group Art Unit:	3992
Filed:	11/18/19	Examiner:	Mark Sager
		Phone No.:	571-272-4454

For: Backward-Compatible Long Training Sequences for Wireless Communication Networks

AGENDA FOR TELEPHONIC INTERVIEW

In response to the non-final office action of 03/19/21, the Applicant requests a telephonic interview between the Examiner and Applicant's attorney Steve Mendelsohn to discuss the following items:

(1) Support for modifying paragraph at column 4, line 30, to refer to "parallel to serial" module instead of "serial to parallel" module (FIG. 2);

(2) Support for modifying paragraph at column 4, line 65, to refer to "serial to parallel" module instead of "parallel to serial" module (FIG. 3);

(3) Support for reciting "digital transmit filter" in claim 29 (col. 4, lines 36-36);

(4) Whether the proposed amendments to claim 1 would overcome the new matter objection, the written description rejection, and the broadening rejection;

(5) Whether the proposed amendments to claims 9 and 23 would overcome the new matter objection and the written description rejection (col. 4, lines 53-55);

(6) Support for previously added claim 26 (FIG. 2);

(7) Support for previously added claim 27 (FIG. 2);

(8) Support for previously added claim 28 (FIG. 2);

(9) Support for previously added claim 29 (FIG. 2);

(10) Support for previously added claim 30 (FIG. 2); and

(11) Whether the reissue oath/declaration is defective in light of the mis-identified serial-to-parallel and parallel-to-serial modules.

Accompanying this Interview Agenda are (i) a set of proposed claim amendments showing changes from the previously pending set of claims and (ii) annotated versions of FIGs. 2 and 3.

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The Applicant's attorney Steve Mendelsohn is available at least the following dates and times for a telephonic interview:

- Tuesday, April 13 between 10 AM and 4 PM ET;
- Wednesday, April 14 between 8 AM and 5 PM ET;
- Monday, April 19 between 8 AM and 2 PM ET;
- Tuesday, April 20 between 1 PM and 6 PM ET;
- Wednesday, April 21 between 8 AM and 6 PM ET;
- Monday, April 26 between 8 AM and 2 PM ET;
- Tuesday, April 27 between 8 AM and 6 PM ET; and
- Wednesday, April 28 between 8 AM and 6 PM ET.

The Applicant thanks the Examiner for the courtesy of this interview.

Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned and practitioners in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application by video conferencing, instant messaging, or electronic mail. I understand that a copy of these communications will be made of record in the application file.

Respectfully submitted,

Date: 4/12/21
Customer No. 22186
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1500 John F. Kennedy Blvd., Suite 312
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PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/686,468	Filing Date 11/18/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	04/22/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 25	Minus	** 28	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 1	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/RHONDA BELL/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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CUSTOMER NO. 22186 *PATENT*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. 1382.001RE

In re application of: Jason Alexander Trachewsky and Rajendra T. Moorti

Serial No.:	16/686,468	Group Art Unit:	3992
Filed:	11/18/19	Examiner:	Mark Sager
		Phone No.:	571-272-4454

For: Backward-Compatible Long Training Sequences for Wireless Communication Networks

AMENDMENT UNDER 37 CFR 1.111

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Amendment is filed in response to the non-final office action of 03/19/21.

SPECIFICATION

Relative to the issued specification, the specification is amended as follows:

- Amend paragraph beginning at column 1, line 8, as follows:

The present application is a reissue application for U.S. Patent No. 7,990,842, which was a CONTINUATION of U.S. application Ser. No. 11/188,771, filed Jul. 26, 2005 and issued as U.S. Patent No. 7,646,703. Said U.S. application Ser. No. 11/188,771 makes reference to, claims priority to and claims benefit from U.S. Application No. 60/591,104, filed Jul. 27, 2004; and U.S. Application No. 60/634,102, filed Dec. 8, 2004. The above-identified applications are hereby incorporated herein by reference in their entirety.

- Amend paragraph beginning at column 2, line 29, as follows:

In 802.11a/802.11g, each data packet starts with a preamble which includes a short training sequence followed by a long training sequence. The short and long training sequences are used for synchronization between the sender and the receiver. The long training sequence of 802.11a and 802.11g is defined such that each of sub-carriers −26 to +26, except for the sub-carrier 0 which is set to 0, has one BPSK [consellation] constellation point, either +1 or −1.

- Amend paragraph beginning at column 2, line 37, as follows:

There exists a need to create a long training sequence of minimum peak-to-average ratio that uses more sub-carriers without interfering with adjacent channels. The inventive long [trains] training sequence with a minimum peak-to-average power ratio should be usable by legacy devices in order to estimate channel impulse response and to estimate carrier frequency offset between a transmitter and a receiver.

- Amend paragraph beginning at column 4, line 4, as follows:

The present invention provides an expanded long training sequence of minimum peak-to-average power ratio and thereby decreases power back-off. The inventive expanded long training sequence may be used by 802.11a or 802.11g devices for estimating the channel impulse response and by a receiver for estimating the carrier frequency offset between the transmitter clock and

receiver clock. The inventive expanded long training sequence is usable by 802.11a or 802.11g systems only if the values at sub-carriers −26 to +26 are identical to those of the current long training sequence used in 802.11a and 802.11g systems. As such, the invention [utilized] utilizes the same +1 or −1 binary phase shift key (BPSK) encoding for each new sub-carrier and the long training sequence of 802.11a or 802.11g systems is maintained in the present invention.

- Amend paragraph beginning at column 4, line 19, as follows:

In a first embodiment of the invention, the expanded long training sequence is implemented in 56 active sub-carriers including sub-carriers −28 to +28 except the 0-index sub-carrier which is set to 0. In another embodiment, an expanded long training sequence is implemented using 63 active sub-carriers, i.e., all of the active sub-carriers (−32 to +31) except the 0-index sub-carrier which is set to 0. In both embodiments of the invention, orthogonality is not affected, since a 64-point orthogonal transform is used to generate the time-domain sequence. Additionally, the output of an autocorrelator for computing the carrier frequency offset is not affected by the extra sub-carriers.

- Amend paragraph beginning at column 4, line 30, as follows:

FIG. 2 illustrates a schematic block diagram of a processor that is configured to generate an expanded long training sequence. Processor 200 includes a symbol mapper 202, a frequency domain window 204, a signal generating circuit 205, an inverse [fast] Fourier transform [(IFFT)] module 206, a [serial to] parallel to serial module 208, a digital transmit filter and/or time domain window module 210, and digital to analog converters (D/A) 212. For an expanded long training sequence, symbol mapper 202 generates symbols from the coded bits for each of the 64 subcarriers of an OFDM sequence. Frequency domain window 204 applies a weighting factor on each subcarrier. Signal generating circuit 205 generates the expanded long training sequence and if 56 active sub-carriers are being used, signal generating circuit generates the expanded long training sequence and stores the expanded long training sequence in sub-carriers −28 to +28_ except the 0-index sub-carrier which is set to 0. If 63 active sub-carriers are being used, signal generating circuit generates the expanded long training sequence and stores the expanded long training sequence in sub-carriers −32 to +32 i.e., all of the active sub-carriers (−32 to +31) except the 0-index sub-carrier which is set to 0. The inventive long training sequence is inputted into an Inverse Fourier Transform 206. The invention uses the same +1 or −1 BPSK encoding for each new sub-carrier. Inverse Fourier Transform 206 may be an inverse Fast Fourier Transform (IFFT)

or Inverse Discrete Fourier Transform [(IFDT)] (IDFT). Inverse Fourier Transform 206 processes the long training sequence from signal generating circuit 205 and thereafter produces an optimal expanded long training sequence with a minimal peak-to-average power ratio. The optimal expanded long training sequence may be used in either 56 active sub-carriers or 63 active subscribers. [Serial to parallel] Parallel to serial module 208 converts the [serial] parallel time domain signals from the Inverse Fourier Transform 206 into [parallel] serial time domain signals that are subsequently filtered and converted to analog signals via the D/A.

- Amend paragraph beginning at column 4, line 65, as follows:

FIG. 3 is a schematic block diagram of a processor that is configured to process an expanded long training sequence. Processor 300 includes a symbol demapper 302, a frequency domain window 304, a fast Fourier transform (FFT) module 306, a [parallel to] serial to parallel module 308, a digital receiver filter and/or time domain window module 310, and analog to digital converters (A/D) 312. A/D converters 312 convert the sequence into digital signals that are filtered via digital receiver filter 310. [Parallel to serial] Serial to parallel module 308 converts the digital time domain signals into a plurality of [serial] time domain signals. FFT module 306 converts the [serial] time domain signals into frequency domain signals. Frequency domain window 304 applies a weighting factor on each frequency domain signal. Symbol demapper 302 generates the coded bits from each of the 64 subcarriers of an OFDM sequence received from the frequency domain window.

CLAIMS

1. (twice amended) A wireless communications device, comprising:

a signal generator that generates an extended long training sequence; and

an Inverse Fourier Transformer operatively coupled to the signal generator,

wherein the Inverse Fourier Transformer processes the extended long training sequence from the signal generator and provides an optimal extended long training sequence with a minimal peak-to-average ratio, and

wherein at least the optimal extended long training sequence is carried by a greater number of subcarriers than a standard wireless networking configuration for an Orthogonal Frequency Division Multiplexing scheme,

wherein the optimal extended long training sequence is carried by exactly 56 active sub-carriers, and

wherein the optimal extended long training sequence is represented by encodings for indexed sub-carriers -28 to +28, excluding indexed sub-carrier 0 which is set to zero, as follows:

Sub-carrier	-28	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15
Encoding	+1	+1	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1
Sub-carrier	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
Encoding	+1	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1	+1
Sub-carrier	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Encoding	+1	-1	-1	+1	+1	-1	+1	-1	+1	-1	-1	-1	-1	-1
Sub-carrier	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Encoding	+1	+1	-1	-1	+1	-1	+1	-1	+1	+1	+1	+1	-1	-1

.

2-3. (canceled)

4. (twice amended) The wireless communications device according to claim [2,] 1, wherein the optimal extended long training sequence has a minimum peak-to-average power ratio of 3.6 dB.

5-7. (canceled)

8. (original) The wireless communications device according to claim 1, wherein a binary phase shift key encoding is used for each sub-carrier above the +26 indexed sub-carrier and below the −26 indexed sub-carrier.

9. (amended) The wireless communications device according to claim 1, wherein the Inverse Fourier Transformer comprises [at least one of the following:] an Inverse Fast Fourier Transformer [and] or an Inverse Discrete Fourier Transformer.

10. (twice amended) The wireless communications device according to claim 1, wherein the wireless communications device comprises one or more of the following: a personal digital assistant, a laptop computer, a personal computer, a processor, and a cellular phone.

11. (original) The wireless communications device according to claim 1, wherein the wireless communications device comprises a wireless mobile communications device.

12. (original) The wireless communications device according to claim 1, wherein the wireless communications device comprises one or more of the following: an access point and a base station.

13. (original) The wireless communications device according to claim 1, wherein the wireless communications device is backwards compatible with legacy wireless local area network devices.

14. (original) The wireless communications device according to claim 1, wherein the optimal extended long training sequence is longer than a long training sequence used by a legacy wireless local area network device in accordance with a legacy wireless networking protocol standard.

15. (original) The wireless communications device according to claim 14, wherein the legacy wireless local area network device uses the optimal extended long training sequence to estimate a carrier frequency offset even though the optimal extended long training sequence is longer than the long training sequence that is specified by the legacy wireless networking protocol standard.

16. (original) The wireless communications device according to claim 15, wherein the long training sequence that is specified by the legacy wireless networking protocol standard is maintained in the extended long training sequence or the optimal extended long training sequence.

17. (original) The wireless communications device according to claim 1, wherein the wireless communications device decreases power back-off.

18. (original) The wireless communications device according to claim 1, wherein the wireless communications device registers with one or more of the following: an access point and a base station.

19. (twice amended) The wireless communications device according to claim 1, wherein the extended long training sequence or the optimal extended long training sequence is encoded using binary phase shift key encoding on each of the 56 active subcarriers.

20. (original) The wireless communications device according to claim 1, comprising:

a symbol mapper operatively coupled to the signal generator, wherein the symbol mapper receives coded bits and generates symbols for each of 64 subcarriers of an Orthogonal Frequency Division Multiplexing sequence.

21. (new) The wireless communications device according to claim 14, wherein the legacy wireless networking protocol standard for the Orthogonal Frequency Division Multiplexing scheme corresponds to exactly 52 active subcarriers.

22. (new) The wireless communications device according to claim 21, wherein, for a long training sequence of the legacy wireless networking protocol standard, the indexed sub-carrier 0 is set to zero and encodings for the indexed sub-carriers -26 to +26 excluding the indexed sub-carrier 0 are:

Sub-carrier	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14
Encoding	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1	+1
Sub-carrier	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
Encoding	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1	+1

Sub-carrier	1	2	3	4	5	6	7	8	9	10	11	12	13
Encoding	+1	-1	-1	+1	+1	-1	+1	-1	+1	-1	-1	-1	-1
Sub-carrier	14	15	16	17	18	19	20	21	22	23	24	25	26
Encoding	-1	+1	+1	-1	-1	+1	-1	+1	-1	+1	+1	+1	+1

.

23. (new, amended) The wireless communications device according to claim 22, wherein:

the Inverse Fourier Transformer comprises an Inverse Fast Fourier Transformer or an Inverse Discrete Fourier Transformer;

the wireless communications device comprises one or more of the following: a personal digital assistant, a laptop computer, a personal computer, a cellular phone, an access point, a processor, and a base station;

the wireless communications device is backwards compatible with the legacy wireless local area network device;

the legacy wireless local area network device uses the optimal extended long training sequence to estimate a carrier frequency offset even though the optimal extended long training sequence is longer than the long training sequence that is specified by the legacy wireless networking protocol standard;

the wireless communications device decreases power back-off;

the extended long training sequence or the optimal extended long training sequence is encoded using binary phase shift key encoding on each of the 56 active subcarriers; and

the wireless communications device further comprises a symbol mapper operatively coupled to the signal generator, wherein the symbol mapper receives coded bits and generates symbols for each of 64 subcarriers of an Orthogonal Frequency Division Multiplexing sequence.

24. (new) The wireless communications device according to claim 1, wherein at least one output of the Inverse Fourier Transformer is operatively coupled to at least one digital-to-analog converter.

25. (new, amended) The wireless communications device according to claim 1, wherein at least one output of the Inverse Fourier Transformer is operatively coupled to multiple digital-to-analog converters.

26. (new) The wireless communications device according to claim 1, wherein an input of the signal generator is operatively coupled to a frequency-domain windower.

27. (new) The wireless communications device according to claim 1, wherein an output of the Inverse Fourier Transformer is operatively coupled to a time-domain windower.

28. (new) The wireless communications device according to claim 27, wherein an output of the time-domain windower is operatively coupled to at least one digital-to-analog converter.

29. (new) The wireless communication device according to claim 1, wherein an output of the Inverse Fourier Transformer is operatively coupled to a digital transmit filter.

30. (new) The wireless communications device according to claim 1, wherein an output of the Inverse Fourier Transformer is operatively coupled to a parallel-to-serial convertor.

REMARKS/ARGUMENTS

Claims 1, 4, and 8-30 are pending in the application. Relative to the issued claims, issued claims 2-3 and 5-7 are canceled, issued claims 1, 4, 9-10, and 19 are amended, and new claims 21-30 are added. Relative to the previously pending claims from the reissue preliminary amendment, claims 1, 4, 9-10, 14, 16, 19, 23, and 25 are newly amended. Note that the new amendments to previously pending claims 14 and 16 have restored those claims back to issued claims 14 and 16, respectively. The Applicant hereby requests further examination and reconsideration of the application in view of the foregoing amendments and these remarks.

The claims presented above show changes relative to the issued claims. Appended to the end of this Amendment is a listing of the same claims showing changes from the previously pending set of claims from the reissue preliminary amendment, with deletions struck through and additions underlined.

The Applicant does not disclaim any subject matter embodied in the specification based upon any cancellation, amendment, or addition of claims contained in this Amendment. Any such changes to the claims are made solely to further prosecution of this application.

Telephonic Interview

On 4/19/21, the Applicant's attorney Steve Mendelsohn participated in a telephonic interview with Examiner Mark Sager and Examiner Alex Kosowski. The Applicant thanks the Examiners for the courtesy of that interview.

Notice of Pre-AIA or AIA Status

On page 2 of the office action, the Examiner stated that this reissue application is a broadening reissue application. In response, the Applicant submits that, based on the amendments to the issued claims listed above, this reissue application is not a broadening reissue application.

Prior or Concurrent Proceedings

U.S. patent no. 7,990,842 ("the '842 patent") was the subject of three different *inter partes* reviews (IPR2019-01174, IPR2019-01345, and IPR2019-01437), all of which were terminated prior to institution. In addition, the '842 patent was the subject of three different lawsuits (Case 3:18-cv-1783-CAB-BLM, Case 3:18-cv-1784-CAB-BLM, and Case 3:18-cv-1786-CAB-BLM), all of which were dismissed by the district court. The Applicant is not aware of any other prior or concurrent proceedings in which the '842 patent is or was involved.

Drawings

On page 3, the Examiner objected to the drawings for failing to show the "monitor" of previously pending claims 10 and 23, the "transmitter" of previously pending claim 25, and the "digital transmit filter" of claim 29.

In response, the Applicant has amended claims 10 and 23 to omit the term "monitor," and claim 25 to omit the term "transmitter." Nevertheless, for the record, the Applicant submits that monitors are part of elements 18, 24, 26, and 32 shown in FIG. 1 and a transmitter is taught in column 4, lines 2-3.

Regarding claim 29, the Applicant submits that FIG. 2 shows element 210, which is described in column 4, lines 35-36, as being either "a digital transmit filter and/or time domain window module." As

such, the Applicant submits that an example of the digital transmit filter recited in claim 29 is shown in FIG. 2.

In view of the foregoing, the Applicant submits that the objections to the drawings have been overcome.

Amendment

On page 4, the Examiner stated that the amendments to claims 1, 4, and 8-30 in the Amendment filed on 11/18/19 do not comply with 37 CFR 1.173(b)-(g), because the Amendment "fails to provide an *explanation of the support in the disclosure of the patent for the changes made to the claims* for new limitations in the pending claims." In response, the Applicant provides the following explanation of the support in the disclosure for the changes made to the claims relative to the issued claims.

Claim 1

Issued claim 1 has been amended to recite "the optimal extended long training sequence is carried by exactly 56 active sub-carriers" and "the optimal extended long training sequence is represented by encodings for indexed sub-carriers -28 to +28, excluding indexed sub-carrier 0 which is set to zero" and to include the specific table of sub-carrier encodings shown in amended claim 1. Support for these amendments is found, for example, in column 3, lines 41-42; column 4, lines 19-21 and lines 41-45; column 4, lines 14-19; and FIG. 4. The Applicant intended to amend claim 1 to recite that there are no more and no less than 56 active sub-carriers.

Claims 2-3 and 5-7

In light of the amendments to issued claim 1, issued claims 2-3 have been canceled for being redundant of amended claim 1, and issued claims 5-7 have been canceled for being inconsistent with amended claim 1.

Claim 4

In light of the cancelation of issued claim 2, issued claim 4, which depended from issued claim 2, has been amended to depend from amended claim 1.

Claim 9

Issued claim 9 has been amended to recite: "the Inverse Fourier Transformer comprises an Inverse Fast Fourier Transformer or an Inverse Discrete Fourier Transformer." Support for this amendment is found, for example, in column 4, lines 53-55.

Claim 10

Issued claim 10 has been amended to recite that the wireless communications device may comprise a processor. Support for this amendment is found, for example, in column 3, lines 36-40; column 4, lines 30-32 and lines 65-67; and FIGs. 2 and 3.

Claim 19

Issued claim 19 has been amended to recite "the 56 active subcarriers" instead of "the subcarriers" in order to conform with amended claim 1.

Claim 21

Support for new claim 21 is found, for example, in column 1, lines 62-65 (which describes legacy devices), and column 2, lines 8-16 (which describes legacy devices using 52 active sub-carriers for OFDM encoding).

Claim 22

Support for new claim 22 is found, for example, in column 4, lines 10-18, and FIG. 4. According to column 4, lines 10-18, to be backwards compatible, the encodings for the 52 sub-carriers -26 to +26 of the expanded long training sequence should be identical to the encodings for the 52 sub-carriers -26 to +26 of the current (i.e., legacy) long training sequence. As shown in FIG. 4, the encodings for the 52 sub-carriers -26 to +26 of the 56-carrier expanded long training sequence are identical to the encodings for the 52 sub-carriers -26 to +26 recited in claim 22 for the long training sequence of the legacy wireless networking protocol standard.

Claim 23

Support for new claim 23 is found, for example, as follows:

- Amended claim 9: "the Inverse Fourier Transformer comprises an Inverse Fast Fourier Transformer or an Inverse Discrete Fourier Transformer";

- Amended claim 10: "the wireless communications device comprises one or more of the following: a personal digital assistant, a laptop computer, a personal computer, a cellular phone, an access point, a processor, and a base station";

- Issued claim 13: "the wireless communications device is backwards compatible with the legacy wireless local area network device";

- Issued claim 15: "the legacy wireless local area network device uses the optimal extended long training sequence to estimate a carrier frequency offset even though the optimal extended long training sequence is longer than the long training sequence that is specified by the legacy wireless networking protocol standard";

- Issued claim 17: "the wireless communications device decreases power back-off";

- Amended claim 19: "the extended long training sequence or the optimal extended long training sequence is encoded using binary phase shift key encoding on each of the 56 active subcarriers"; and

- Issued claim 20: "the wireless communications device further comprises a symbol mapper operatively coupled to the signal generator, wherein the symbol mapper receives coded bits and generates symbols for each of 64 subcarriers of an Orthogonal Frequency Division Multiplexing sequence."

Claim 24

Support for new claim 24 is found, for example, in FIG. 2, which shows at least one output of Inverse Fourier Transformer 206 operatively coupled to at least one digital-to-analog converter 212. See, also, column 4, lines 30-37.

Claim 25

Support for new claim 25 is found, for example, in FIG. 2, which shows at least one output of Inverse Fourier Transformer 206 operatively coupled to multiple digital-to-analog converters 212. See, also, column 4, lines 30-37.

Claim 26

Support for new claim 26 is found, for example, in FIG. 2, which shows an input of signal generator 205 operatively coupled to frequency-domain windower 204. See, also, column 4, lines 30-37.

Claim 27

Support for new claim 27 is found, for example, in FIG. 2, which shows an output of Inverse Fourier Transformer 206 operatively coupled to time-domain windower 210. See, also, column 4, lines 30-37.

Claim 28

Support for new claim 28 is found, for example, in FIG. 2, which shows an output of time-domain windower 210 operatively coupled to at least one digital-to-analog converter 212. See, also, column 4, lines 30-37.

Claim 29

Support for new claim 29 is found, for example, in FIG. 2, which shows an output of Inverse Fourier Transformer 206 operatively coupled to digital transmit filter 210. See, also, column 4, lines 30-37.

Claim 30

Support for new claim 30 is found, for example, in FIG. 2, which shows an output of Inverse Fourier Transformer 206 operatively coupled to parallel-to-serial converter 208. See, also, column 4, lines 30-37. Note that, as described further below, parallel-to-serial converter 208 of FIG. 2 is misidentified as a "serial-to-parallel" converter in the specification.

Specification

On page 10, the Examiner objected to the Amendment filed 11/18/19 because "it introduces new matter into the disclosure."

Regarding claim 1, the Examiner objected to the exclusion of indexed sub-carrier 0 without reciting "which is set to 0." In response, twice-amended claim 1 recites "excluding indexed sub-carrier 0 which is set to zero."

Regarding claims 9 and 23, the Examiner objected to the recitation "the Inverse Fourier Transformer comprises at least one of the following: an Inverse Fast Fourier Transformer and an Inverse Discrete Fourier Transformer." In response, amended claim 9 and new, amended claim 23 recite: "the Inverse Fourier Transformer comprises an Inverse Fast Fourier Transformer or an Inverse Discrete Fourier Transformer."

Regarding claims 10 and 23, the Examiner objected to the recitation of "a monitor." In response, twice-amended claim 10 and new, amended claim 23 do not recite "a monitor."

Regarding claim 25, the Examiner stated that FIG. 2 does not describe the recitation "each of which is coupled to a transmitter." In response, new, once-amended claim 25 does not include that recitation.

Regarding claim 26, the Examiner stated that FIG. 2 does not describe the recitation "an input of the signal generator is coupled to a frequency-domain windower." In response, the Applicant submits that FIG. 2 shows an input of signal generator 205 operatively coupled to frequency-domain windower 204. See, also, column 4, lines 30-37.

Regarding claim 27, the Examiner stated that FIG. 2 does not describe the recitation "an output of the Inverse Fourier Transformer is operatively coupled to a time-domain windower." In response, the Applicant submits that FIG. 2 shows an output of Inverse Fourier Transformer 206 operatively coupled to time-domain windower 210. See, also, column 4, lines 30-37.

Regarding claim 28, the Examiner stated that FIG. 2 does not describe the recitation "an output of the time-domain windower is operatively coupled to at least one digital-to-analog converter." In response, the Applicant submits that FIG. 2 shows an output of time-domain windower 210 operatively coupled to at least one digital-to-analog converter 212. See, also, column 4, lines 30-37.

Regarding claim 29, the Examiner stated that FIG. 2 does not describe the recitation "coupled to a digital transmit filter." In response, the Applicant submits that FIG. 2 shows an output of Inverse Fourier Transformer 206 operatively coupled to digital transmit filter 210. See, also, column 4, lines 30-37.

Regarding claim 30, the Examiner stated that FIG. 2 does not describe the recitation "coupled to a parallel-to-serial converter." In response, the Applicant submits that FIG. 2 shows an output of Inverse Fourier Transformer 206 operatively coupled to parallel-to-serial converter 208. See, also, column 4, lines 30-37. As described further below, the parallel-to-serial converter 208 of FIG. 2 was misidentified in the specification as a "serial-to-parallel" converter.

Regarding the paragraph beginning at column 2, line 29, the amended paragraph recites "except for the subcarrier 0 which is set to 0."

Regarding the paragraph beginning at column 2, line 59, the Examiner objected to the deletion of "more than." In response, the Applicant has withdrawn that amendment to the specification.

Regarding the paragraph beginning at column 3, line 4, the Examiner objected to the deletion of "more than." In response, the Applicant has withdrawn that amendment to the specification.

Regarding the paragraph beginning at column 4, line 30, the phrase "an inverse fast Fourier transform (IFFT) module 206" at line 34 has been amended to be "an inverse Fourier transform module 206." Support for this amendment is found at lines 51-53, which refer to "Inverse Fourier Transform 206" and lines 53-55, which teaches that the Inverse Fourier Transform 206 may be an inverse Fast Fourier Transform or an Inverse Discrete Fourier Transform. In addition, the abbreviation for Inverse Discrete Fourier Transform has been corrected to be "IDFT" instead of "IFDT."

Further regarding the paragraph beginning at column 4, line 30, the Examiner objected to the changes related to replacing "serial to parallel" with "parallel to serial". This paragraph relates to the processor shown in FIG. 2, which generates an expanded long training sequence from coded bits. As described in that paragraph, the processing of FIG. 2 flows from left to right from the symbol mapper 202

on the left to the D/A converters 212 on the right. As shown in FIG. 2, module 208 converts multiple, parallel streams received from the Inverse Fourier Transform 206 into a single stream that is applied to module 210. Although module 208 is identified and described in column 4, lines 61-65 as a "serial to parallel converter" that "converts the serial time domain signals into parallel time domain signals," a person of ordinary skill in the art (POSITA) at the time the patent was filed would have understood that module 208 has been misidentified and misdescribed. Rather, a POSITA would have understood that module 208 is actually a parallel-to-serial converter that converts parallel time-domain signals into a serial time-domain signal.

Regarding the paragraph beginning at column 4, line 65, the Examiner objected to the changes related to replacing "parallel to serial" with "serial to parallel". This paragraph relates to the processor shown in FIG. 3, which processes an expanded long training sequence to recover coded bits. As described in that paragraph and unlike the processing of FIG. 2, the processing of FIG. 3 flows from right to left from the A/D converters 312 on the right to the symbol demapper 302 on the left. As shown in FIG. 3, module 308 converts the single stream from module 310 into multiple, parallel streams that are applied to FFT module 306. Although module 308 is identified and described in column 5, lines 6-8 as a "parallel to serial converter" that "converts the digital time domain signals into a plurality of serial time domain signals," a POSITA would have understood that module 308 has been misidentified and misdescribed. Rather, a POSITA would have understood that module 308 is actually a serial-to-parallel converter that converts a serial time-domain signal into parallel time-domain signals.

Claim Rejections - 35 U.S.C. 112(a) or 35 U.S.C. 112, First Paragraph

On page 14, the Examiner rejected claims 1, 4, 8-21, and 23-30 under 35 U.S.C. 112(a) or 35 U.S.C. 112, First Paragraph.

Regarding claim 1, twice-amended claim 1 recites "excluding indexed sub-carrier 0 which is set to zero."

Regarding claims 9 and 23, amended claim 9 and new, amended claim 23 recite "the Inverse Fourier Transformer comprises an Inverse Fast Fourier Transformer or an Inverse Discrete Fourier Transformer."

Regarding claims 10 and 23, twice-amended claim 10 and new, amended claim 23 do not recite "a monitor."

Regarding claim 30, as described above, the parallel-to-serial converter 208 of FIG. 2 was misidentified in the specification as a "serial-to-parallel" converter.

Regarding the changes to the specification called out by the Examiner on pages 16-17 of the office action, see the discussion in the previous section of this response.

In view of the foregoing, the Applicant respectfully submits that the rejections of the claims and the objections to the specification based on Section 112(a) / 112, First Paragraph, have been overcome.

Claim Rejections - 35 U.S.C. 112(b) or 35 U.S.C. 112, Second Paragraph

On page 18, the Examiner rejected claims 10 and 23 under 35 U.S.C. 112(b) or 35 U.S.C. 112, Second Paragraph, because it is "confusing or unclear as to how their monitor operates as a communications device as recited therein and Applicant does not submit evidence their monitor operates as a communications device." In response, the Applicant submits that previously pending claims 10 and 23 recited that "the wireless communications device comprises one or more of the following: a personal

digital assistant, a laptop computer, a personal computer, a processor, a monitor, and a cellular phone" (emphasis added). Previously pending claims 10 and 23 did not recite that the monitor "operates as a communications device." FIG. 1 shows laptop computers 18 and 26 and personal computers 24 and 32, each of which operates as a communications device and each of which comprises a monitor. Nevertheless, in order to move prosecution of this application forward, twice-amended claim 10 and new, amended clam 23 do not recite "the monitor."

In view of the foregoing, the Applicant respectfully submits that the rejections of the claims based on Section 112(b) / 112, Second Paragraph, have been overcome.

Reissue Applications

On page 18, the Examiner rejected claims 1, 4, 8-21, and 24-30 under 35 U.S.C. 251 as being broadened in a reissue application filed outside the two-year statutory period. In response, the Applicant submits that none of the issued claims have been broadened into the currently pending claims.

On page 20, the Examiner stated that the reissue oath/declaration is defective and rejected claims 1, 4, and 8-30 as being based upon a defective reissue declaration by the inventor under 35 U.S.C. 251. In particular, the reissue oath/declaration stated that the specification incorrectly describes module 208 of FIG. 2 as a serial-to-parallel converter and module 308 of FIG. 3 as a parallel-to-serial converter, when, in fact, module 208 is a parallel-to-serial converter and module 308 is a serial-to-parallel converter, as evident in FIGs. 2 and 3 as described herein previously.

The processor of FIG. 2 simply would not operate as intended if module 208 were a serial-to-parallel converter. In particular, the processor of FIG. 2 would not be able to generate the intended expanded long training sequence from the provided coded bits if module 208 converted a single, serial stream into a plurality of parallel streams.

Similarly, the processor of FIG. 3 simply would not operate as intended if module 308 were a parallel-to-serial converter. In particular, the processor of FIG. 3 would not be able to process the provided expanded long training sequence to recover the intended coded bits if module 308 converted a plurality of parallel streams into a single, serial stream.

To these extents, the issued patent was at least partially inoperative and/or invalid. Accompanying this Amendment is a Substitute Reissue Declaration that clarifies that these errors resulted in the issued patent being at least partially inoperative and/or invalid, and that the proposed corrections overcome those problems with the issued patent. As such, the Applicant respectfully submits that the substitute reissue oath/declaration is not defective and that the rejections of claims 1, 4, and 8-30 under 35 U.S.C. 251 have been overcome and should be withdrawn.

Conclusion

In view of the above amendments and remarks, the Applicant believes that the specification and claims as amended are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Respectfully submitted,

Date: 04/22/2021

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ANNOTATED CLAIMS

1. A wireless communications device, comprising:

a signal generator that generates an extended long training sequence; and

an Inverse Fourier Transformer operatively coupled to the signal generator,

wherein the Inverse Fourier Transformer processes the extended long training sequence from the signal generator and provides an optimal extended long training sequence with a minimal peak-to-average ratio, and

wherein at least the optimal extended long training sequence is carried by a greater number of subcarriers than a ~~legacy [~~standard~~]~~ wireless networking ~~protocol standard~~ configuration for an Orthogonal Frequency Division Multiplexing scheme,

wherein the optimal extended long training sequence is carried by exactly 56 active sub-carriers, and

wherein the optimal extended long training sequence is represented by encodings for indexed sub-carriers -28 to +28, excluding indexed sub-carrier 0 which is set to zero, as follows:

Sub-carrier	-28	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15
Encoding	+1	+1	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1
Sub-carrier	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
Encoding	+1	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1	+1
Sub-carrier	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Encoding	+1	-1	-1	+1	+1	-1	+1	-1	+1	-1	-1	-1	-1	-1
Sub-carrier	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Encoding	+1	+1	-1	-1	+1	-1	+1	-1	+1	+1	+1	+1	-1	-1

.

2-3. (canceled)

4. The wireless communications device according to claim [2,] 1, wherein the ~~[~~optimal extended long training sequence has a minimum~~]~~ ~~minimal~~ peak-to-average power ratio ~~[~~of~~]~~ ~~is~~ 3.6 dB.

5-7. (canceled)

8. The wireless communications device according to claim 1, wherein a binary phase shift key encoding is used for each sub-carrier above the +26 indexed sub-carrier and below the −26 indexed sub-carrier.

9. The wireless communications device according to claim 1, wherein the Inverse Fourier Transformer comprises ~~at least one of the following: —~~an Inverse Fast Fourier Transformer ~~and~~ or an Inverse Discrete Fourier Transformer.

10. The wireless communications device according to claim 1, wherein the wireless communications device comprises one or more of the following: a personal digital assistant, a laptop computer, a personal computer, a processor, ~~a monitor,~~ and a cellular phone.

11. The wireless communications device according to claim 1, wherein the wireless communications device comprises a wireless mobile communications device.

12. The wireless communications device according to claim 1, wherein the wireless communications device comprises one or more of the following: an access point and a base station.

13. The wireless communications device according to claim 1, wherein the wireless communications device is backwards compatible with legacy wireless local area network devices.

14. The wireless communications device according to claim 1, wherein the optimal extended long training sequence is longer than a long training sequence used by a legacy wireless local area network device in accordance with ~~[~~a~~]~~ ~~the~~ legacy wireless networking protocol standard.

15. The wireless communications device according to claim 14, wherein the legacy wireless local area network device uses the optimal extended long training sequence to estimate a carrier frequency offset even though the optimal extended long training sequence is longer than the long training sequence that is specified by the legacy wireless networking protocol standard.

16. The wireless communications device according to claim 15, wherein the long training sequence that is specified by the legacy wireless networking protocol standard is maintained in ~~[~~the extended long training sequence or~~]~~ the optimal extended long training sequence.

17. The wireless communications device according to claim 1, wherein the wireless communications device decreases power back-off.

18. The wireless communications device according to claim 1, wherein the wireless communications device registers with one or more of the following: an access point and a base station.

19. The wireless communications device according to claim 1, wherein ~~[~~the extended long training sequence or~~]~~ the optimal extended long training sequence is encoded using binary phase shift key encoding on each of the 56 active subcarriers.

20. The wireless communications device according to claim 1, comprising:

a symbol mapper operatively coupled to the signal generator, wherein the symbol mapper receives coded bits and generates symbols for each of 64 subcarriers of an Orthogonal Frequency Division Multiplexing sequence.

21. The wireless communications device according to claim 14, wherein the legacy wireless networking protocol standard for the Orthogonal Frequency Division Multiplexing scheme corresponds to exactly 52 active subcarriers.

22. The wireless communications device according to claim 21, wherein, for a long training sequence of the legacy wireless networking protocol standard, the indexed sub-carrier 0 is set to zero and encodings for the indexed sub-carriers -26 to +26 excluding the indexed sub-carrier 0 are:

Sub-carrier	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14
Encoding	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1	+1
Sub-carrier	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
Encoding	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1	+1
Sub-carrier	1	2	3	4	5	6	7	8	9	10	11	12	13
Encoding	+1	-1	-1	+1	+1	-1	+1	-1	+1	-1	-1	-1	-1
Sub-carrier	14	15	16	17	18	19	20	21	22	23	24	25	26

Encoding	-1	+1	+1	-1	-1	+1	-1	+1	-1	+1	+1	+1	+1

.

23. The wireless communications device according to claim 22, wherein:

the Inverse Fourier Transformer comprises ~~at least one of the following: an~~ Inverse Fast Fourier Transformer ~~and~~ or an Inverse Discrete Fourier Transformer;

the wireless communications device comprises one or more of the following: a personal digital assistant, a laptop computer, a personal computer, a cellular phone, an access point, a processor, ~~a monitor,~~ and a base station;

the wireless communications device is backwards compatible with the legacy wireless local area network device;

the legacy wireless local area network device uses the optimal extended long training sequence to estimate a carrier frequency offset even though the optimal extended long training sequence is longer than the long training sequence that is specified by the legacy wireless networking protocol standard;

the wireless communications device decreases power back-off;

the extended long training sequence or the optimal extended long training sequence is encoded using binary phase shift key encoding on each of the 56 active subcarriers; and

the wireless communications device further comprises a symbol mapper operatively coupled to the signal generator, wherein the symbol mapper receives coded bits and generates symbols for each of 64 subcarriers of an Orthogonal Frequency Division Multiplexing sequence.

24. The wireless communications device according to claim 1, wherein at least one output of the Inverse Fourier Transformer is operatively coupled to at least one digital-to-analog converter.

25. The wireless communications device according to claim 1, wherein at least one output of the Inverse Fourier Transformer is operatively coupled to multiple digital-to-analog converters~~, each of which is coupled to a transmitter~~.

26. The wireless communications device according to claim 1, wherein an input of the signal generator is operatively coupled to a frequency-domain windower.

27. The wireless communications device according to claim 1, wherein an output of the Inverse Fourier Transformer is operatively coupled to a time-domain windower.

28. The wireless communications device according to claim 27, wherein an output of the time-domain windower is operatively coupled to at least one digital-to-analog converter.

29. The wireless communication device according to claim 1, wherein an output of the Inverse Fourier Transformer is operatively coupled to a digital transmit filter.

30. The wireless communications device according to claim 1, wherein an output of the Inverse Fourier Transformer is operatively coupled to a parallel-to-serial convertor.

Doc Code: REIS.DECL
Document Description: Reissue Declaration Filed In Accordance With MPEP 1414

PTO/AIA/06 (02-17)
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REISSUE APPLICATION DECLARATION BY THE ASSIGNEE	Docket Number (optional) 1382.001RE

I hereby declare that:

The residence and mailing address of the inventor or joint inventors are stated below.

Name of the Assignee:

Bell Northern Research LLC

I am authorized to act on behalf of the assignee (if the assignee is a juristic entity).

The entire title to the patent identified below is vested in said assignee, or if there are multiple assignees/owners, all assignees/owners have executed a Reissue Application Declaration to account for the entire title of the patent identified below.

Inventor Jason Alexander Trachewsky

Residence: City	State	Country
Menlo Park	CA	US

Mailing Address

127 Hillside Avenue

City	State	Zip	Country
Menlo Park	CA	94025	US

☑ Additional Inventors are named on separately numbered sheets attached hereto

Patent Number 7,990,842	Patent Issue Date August 2, 2011

I believe said inventor(s) to be the original inventor or original joint inventors of the subject matter which is described and claimed in said patent, for which a reissue patent is sought on the invention titled:

Backward-Compatible Long Training Sequences for Wireless Communication Networks

the specification of which

☑ is attached hereto.

☐ was filed on _____ as reissue application number _____.

The above-identified application was made or authorized to be made by me.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

I believe the original patent to be wholly or partly inoperative or invalid, for the reasons described below.
(Check all boxes that apply.)

☑ by reason of a defective specification or drawing.

☑ by reason of the patentee claiming more or less than he had the right to claim in the patent.

☐ by reason of other errors.

This collection of information is required by 37 CFR 1.175. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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REISSUE APPLICATION DECLARATION BY THE ASSIGNEE	Docket Number (Optional) 1382.001RE

At least one error upon which reissue is based is described below. If the reissue is a broadening reissue, a claim that the application seeks to broaden must be identified and the box below must be checked:

The specification as issued incorrectly describes (i) module 208 of FIG. 2 as a serial to parallel module and (ii) module 308 of FIG. 3 as a parallel to serial module. These errors resulted in the issued patent being at least partially inoperative and/or invalid. This reissue application amends the specification to correctly describe (i) module 208 as a parallel to serial module and (ii) module 308 as a serial to parallel module. These changes overcome the problems with the issued patent.

[Attach additional sheets, if needed.]

☐ **The application for the original patent was filed under 37 CFR 1.46 by the assignee of the entire interest.**

I hereby appoint:

☑ Practitioners associated with Customer Number: 22186

OR

☐ Practitioner(s) named below:

Name	Registration Number

as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith.

Correspondence Address: Direct all communications about the application to:

☑ The address associated with Customer Number: 22186

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

Signature	Date (Optional)
Legal name of person signing: Afzal Dean	
Address of Assignee: 401 North Michigan Avenue, Chicago, IL 60611	

Electronic Acknowledgement Receipt

EFS ID:	42520261
Application Number:	16686468
International Application Number:	
Confirmation Number:	2785
Title of Invention:	Backward-Compatible Long Training Sequences for Wireless Communication Networks
First Named Inventor/Applicant Name:	Jason Alexander Trachewsky
Customer Number:	22186
Filer:	Steve Mendelsohn/Eri Yoneda
Filer Authorized By:	Steve Mendelsohn
Attorney Docket Number:	1382.001RE
Receipt Date:	22-APR-2021
Filing Date:	18-NOV-2019
Time Stamp:	09:51:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		1382-001RE_amend_oa1_v8.pdf	126700 b477a4f6b7ec6f5a7736ad3dd6f048fb8c706f40	yes	22

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Specification	2	4
	Claims	5	9
	Applicant Arguments/Remarks Made in an Amendment	10	17
	Claims	18	22

Warnings:					
Information:					
2	Reissue dec filed in accordance with MPEP 1414	1382-001RE_Supplemental_Reissue_Declaration_by_Assignee_v1.pdf	515537 5954b4a23429ce2201c1f746776f8cd3fef64ceb	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	642237		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/686,468	11/18/2019	Jason Alexander Trachewsky	1382.001RE	2785

22186 7590 03/19/2021

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EXAMINER	
SAGER, MARK ALAN	

ART UNIT	PAPER NUMBER
3992	

NOTIFICATION DATE	DELIVERY MODE
03/19/2021	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docketing@mendelip.com

Office Action Summary	Application No. 16/686,468	Applicant(s) Trachewsky et al.	
	Examiner MARK A SAGER	Art Unit 3992	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 11/18/2019.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1,4 and 8-30 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1,4 and 8-30 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date 3/13/2020, 5/12/2020.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

2. This non-final action is in response to reissue application filed 11/18/2019 that is a broadening reissue of Patent 7990842 of application 12684650 that amends specification, amends claims 1, 4, 10, 14, 16 and 19, cancels claims 2-3, and 5-7 and adds new claims 21-30.

3. For reissue applications filed before September 16, 2012, all references to 35 U.S.C. 251 and 37 CFR 1.172, 1.175, and 3.73 are to the law and rules in effect on September 15, 2012. Where specifically designated, these are "pre-AIA" provisions.

For reissue applications filed on or after September 16, 2012, all references to 35 U.S.C. 251 and 37 CFR 1.172, 1.175, and 3.73 are to the current provisions.

Prior or Concurrent Proceedings

4. Applicant is reminded of the continuing obligation under 37 CFR 1.178(b), to timely apprise the Office of any prior or concurrent proceeding in which the 7990842 patent is or was involved. These proceedings would include interferences, reissues, reexaminations, and litigation.

Information Material to Patentability

5. Applicant is further reminded of the continuing obligation under 37 CFR 1.56, to timely apprise the Office of any information which is material to patentability of the claims under consideration in this reissue application. These obligations rest with each individual associated with the filing and prosecution of this application for reissue. See also MPEP §§ 1404, 1442.01 and 1442.04.

Drawings

6. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "**monitor**" as now recited in claims 10 and 23; the "each of which is coupled to a **transmitter**" as now recited in claim 25 and the "**digital transmit filter**" as now recited in claim 29 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Amendment

7. **Applicant is notified that any subsequent amendment to the specification and/or claims must comply with 37 CFR 1.173(b)-(g).**

(b) *Making amendments in a reissue application.* An amendment in a reissue application is made either by physically incorporating the changes into the specification when the application is filed, or by a separate amendment

paper. If amendment is made by incorporation, markings pursuant to paragraph (d) of this section must be used. If amendment is made by an amendment paper, the paper must direct that specified changes be made, as follows:

> (1) *Specification other than the claims.* Changes to the specification, other than to the claims, must be made by submission of the entire text of an added or rewritten paragraph, including markings pursuant to paragraph (d) of this section, except that an entire paragraph may be deleted by a statement deleting the paragraph without presentation of the text of the paragraph. The precise point in the specification must be identified where any added or rewritten paragraph is located. This paragraph applies whether the amendment is submitted on paper or compact disc (see §§ 1.52(e)(1) and 1.821(c), but not for discs submitted under § 1.821(e)).
>
> (2) *Claims.* An amendment paper must include the entire text of each claim being changed by such amendment paper and of each claim being added by such amendment paper. For any claim changed by the amendment paper, a parenthetical expression "amended," "twice amended," *etc.*, should follow the claim number. Each changed patent claim and each added claim must include markings pursuant to paragraph (d) of this section, except that a patent claim or added claim should be canceled by a statement canceling the claim without presentation of the text of the claim....

(c) *Status of claims and support for claim changes.* Whenever there is an amendment to the claims pursuant to paragraph (b) of this section, there must also be supplied, on pages separate from the pages containing the changes, the status (*i.e.*, pending or canceled), as of the date of the amendment, of all patent claims and of all added claims, and an explanation of the support in the disclosure of the patent for the changes made to the claims.

(d) *Changes shown by markings.* Any changes relative to the patent being reissued which are made to the specification, including the claims, upon filing, or by an amendment paper in the reissue application, must include the following markings:

> (1) The matter to be omitted by reissue must be enclosed in brackets; and
> (2) The matter to be added by reissue must be underlined, except for amendments submitted on compact discs (§§ 1.96 and 1.821(c)). Matter added by reissue on compact discs must be preceded with "<U>" and end with "</U>" to properly identify the material being added...

(g) *Amendments made relative to the patent.* All amendments must be made relative to the patent specification, including the claims, and drawings, which are in effect as of the date of filing of the reissue application.

8. **The Amendment filed Nov. 18, 2019 proposes amendments to claims 1, 4, and 8-30 that do not comply with 37 CFR 1.173 (b)-(g), which sets forth the manner of making amendments in reissue applications**. The amendment fails to provide an *explanation of the support in the disclosure of the patent for the changes made to the claims* for new limitations in the pending claims. To the extent Applicant stating, on page 11 of remarks of preliminary amendment,

"Support for the amendments to claims 1, 4, 10, and 19 and for new claims 21-30 is found, for example, as follows:

Claim	Support
1	FIG. 4
4	Column 5, lines 16-29
10	FIG. 1
19	FIG. 4
21	Column 2, lines 8-16
22	Column 2, lines 24-27; column 4, lines 10-18; and FIG. 4
23	Claims 9, 10, 12, 13, 15, 17, 19, 20, and FIG. 1
24-30	FIG. 2

," is not an explanation of the support in the disclosure of the patent for the changes made to the claims for new the limitations noted next.

For example, regarding claim 1, their cited support of FIG. 4 is not an explanation of the support in the disclosure of the patent for the changes made to the claims for newly recited limitation "wherein the optimal extended long training sequence is carried by exactly 56 active sub-carriers, and wherein the optimal extended long training sequence is represented by encodings for indexed sub-carriers -28 to +28 excluding indexed sub-carrier 0 as follows:

Sub-carrier	-28	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15
Encoding	+1	+1	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1
Sub-carrier	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
Encoding	+1	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1	+1
Sub-carrier	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Encoding	+1	-1	-1	+1	+1	-1	+1	-1	+1	-1	-1	-1	-1	-1
Sub-carrier	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Encoding	+1	+1	-1	-1	+1	-1	+1	-1	+1	+1	+1	+1	-1	-1

."

For example, regarding claim 1, their cited support of FIG. 4 is not an explanation of the support in the disclosure of the patent for the changes made to the claims for newly recited

limitation "exactly 56 active sub-carriers" especially for the situation of more than 56 such as if there are 63 active sub-carriers (i.e., see '842 at 4:45-50 and 59-61). Also, lacking evidence to the contrary, '842 describes "except the 0-index sub-carrier which is set to 0" rather than "excluding indexed sub-carrier 0" as recited herein where lacking "*which is set to 0*," the value of 0-index sub-carrier is undefined which is broader than '842 disclosure. There is no basis in '842 or its parent patents for "excluding indexed sub-carrier 0" as recited herein and their stated support of FIG 4 does not provide an explanation. Also, the table in claim 22 appears redundant to claim 1; while, claim 22 limits sub-carrier 0 which is set to 0. Similarly, regarding claim 21, lacking evidence to the contrary, for the limitation "**exactly 52** active subcarriers" especially for the situation more than 56 such as if there are 63 active sub-carriers (i.e., see '842 at 4:45-50). Similarly, cited support of column 2, lines 8-16 is not an explanation of the support for "**exactly 52** active subcarriers" as now recited in new claim 21.

For example, regarding claims 10 and 23, their cited support of FIG. 1 is not an explanation of the support in the disclosure of the patent for the changes made to the claims for newly recited "a monitor" as a communications device.

For example, regarding claims 9 and 23, their cited support of FIG. 1 and listed claims is not an explanation of the support in the disclosure of the patent for the changes made to the claims for newly recited limitation "wherein: the Inverse Fourier Transformer comprises at least one of the following: an Inverse Fast Fourier Transformer and an Inverse Discrete Fourier Transformer" especially in light that '842 @ 4:53-55 describes them in the alternative (e.g., as exclusive "**or**" rather than inclusive "*and*") as a choice between IFFT or IFDT. This limitation was newly added in 12/684650 in amendment filed 12/1/2010 (e.g. not co-filed with filing of original application) that became claim 9 of 7990842.

For example, regarding claims 16 and 19, their cited support of FIG 4 is not an explanation of the support in the disclosure of the patent for the changes made to the claims for omission of "[the extended long training sequence or]" as now recited; see '703 claim 16 and 19.

For example, regarding claim 24, their cited support of FIG. 2 is not an explanation of the support in the disclosure of the patent for the changes made to the claims for newly recited limitation "wherein at least one output of the Inverse Fourier Transformer is operatively coupled to at least one **digital-to-analog converter**."

For example, regarding claim 25, their cited support of FIG. 2 is not an explanation of the support in the disclosure of the patent for the changes made to the claims for newly recited limitation "each of which is coupled to a **transmitter**."

For example, regarding claim 26, their cited support of FIG. 2 is not an explanation of the support in the disclosure of the patent for the changes made to the claims for newly recited limitation "wherein an input of the signal generator is operatively coupled to a **frequency-domain windower**."

For example, regarding claim 27, their cited support of FIG. 2 is not an explanation of the support in the disclosure of the patent for the changes made to the claims for newly recited limitation "wherein an output of the Inverse Fourier Transformer is operatively coupled to a **time-domain windower**."

For example, regarding claim 28, their cited support of FIG. 2 is not an explanation of the support in the disclosure of the patent for the changes made to the claims for newly recited limitation "wherein an output of the time-domain windower is operatively coupled to at least one **digital-to-analog converter**."

For example, regarding claim 29, their cited support of FIG. 2 is not an explanation of the support in the disclosure of the patent for the changes made to the clams for the newly recited "coupled to a **digital transmit filter**."

Further, regarding claim 30, their cited support of FIG. 2 is not an explanation of the support in the disclosure of the patent for the changes made to the clams for the newly recited "coupled to a **parallel-to-serial convertor**" in light that parent '703 and 60/634102 do not describe device as recited herein and where serial-to-parallel converter and parallel-to-serial converter devices are not a same device but instead perform reverse function/processing.

Further, regarding claims 1, 9, 10, 16, 19, 23, 25, 29 and 30, their cited support is not an explanation of the support in the disclosure of the patent for the changes made to the claims for newly recited limitations noted above especially in light that neither 60/634102 or 60/591104 describe these new limitations in manner recited.

Also, the amendment fails to provide an *explanation of the support in the disclosure of the patent for the changes made to the specifications* to the extent Applicant stating, on page 11 of remarks of preliminary amendment, "Support for the following amendments to correct substantive errors is found, for example, as follows:"

Paragraph	Support
Column 2, line 29	Sub-carrier index 0 of FIG. 4
Column 2, line 59	FIG. 4
Column 3, line 4	FIG. 5
Column 4, line 19	Sub-carrier index 0 of FIG. 4
Column 4, line 30 (module 208)	Module 208 of FIG. 2
Column 4, line 30 (sub-carrier 0)	Sub-carrier index 0 of FIG. 4
Column 4, line 65	Module 308 of FIG. 3

The listed support in table above is not an explanation of the support in the disclosure of the patent for the changes made to the specification for the current changes to paragraphs

beginning at column 2, line 29 to add "except for the subcarrier 0" where although this limitation is newly added herein it was previously described elsewhere in '842 and 60/634102 with its value **which is set to 0** so as to define/limit value of subcarrier 0 to zero,

beginning at column 2, line 59 to omit "more than" where there is no explanation for this omission,

beginning at column 3, line 4 to omit "more than" where there is no explanation for this omission,

beginning at column 4, line 19 to add "except the 0-index subcarrier which is set to 0" where this limitation is not newly added herein but was previously described in '842,

beginning at column 4, line 30 to omit "serial to", to add/replace with "to serial", to add "except the 0-index sub-carrier which is set to 0" where this limitation is not newly added herein but instead was previously described in parent patent '703 and 60/634102 (paragraphs [0021] and [0022]), to omit "Serial to parallel", to add/replace with "Parallel to serial", to omit "serial time domain", to add/replace with "parallel", to omit "parallel" and to add/replace with "serial" where there is no explanation for the numerous changes regarding modules 208, 210, 308 and 310 especially in light that parent patent '703 and 60/634102 @ paragraphs [0019]-[0024] does not describe the modules 208, 210, 308 and 310 as now recited herein,

beginning at column 4, line 65 to omit "parallel to", to add "to parallel", to omit "Parallel to serial", to add "Serial to parallel", to omit "serial time domain", to omit "the serial time domain" to add/replace with "these" where there is no explanation for the changes regarding modules 208, 210, 308 and 310 especially in light that parent patent '703 and 60/634102 @ paragraphs [0019]-[0024] does not describe the modules 208, 210, 308 and 310 as recited herein.

Further, regarding changes to the specification, the cited support is not an explanation of the support in the disclosure of the patent for the changes made to the specification for newly recited changes noted above especially in light that neither parent patent '703 , 60/634102 or 60/591104 describe these new changes in manner recited.

Specification

9. **The amendment filed Nov. 18, 2019 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure**. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. Lacking evidence to the contrary, the added material which is not supported by the original disclosure is as follows: as further specified below, the changes to the disclosure of '842 and to the claims as recited herein are not supported by the original disclosure of the patent (see MPEP 1412.01) including its priority documents 60/634102 and/or 60/591104.

Regarding claim 1, lacking evidence to the contrary, '842 describes "except the 0-index sub-carrier which is set to 0" rather than ONLY "excluding indexed sub-carrier 0" as recited in claim 1 herein where lacking reciting "**which is set to 0**," the value of 0-index sub-*carrier is undefined herein so it is broader than '842 disclosure.* It is noted claim 22 limits value of sub-carrier 0 which is set to 0. There is no basis in '842 or its parent patents for "excluding indexed sub-carrier 0" as recited herein and their stated support of FIG 4 does not provide an explanation.

Regarding claims 10 and 23, lacking evidence to the contrary, FIG. 1 does not describe newly recited limitation "a monitor" as a communications device and Applicant does not submit evidence their monitor operates as a communications device.

Regarding claims 9 and 23, lacking evidence to the contrary, their cited support of FIG. 1 and listed claims on page 11 of remarks in cited amendment do not describe newly recited limitation "wherein: the Inverse Fourier Transformer comprises at least one of the following: an Inverse Fast Fourier Transformer and an Inverse Discrete Fourier Transformer" especially in light that '842 @ 4:53-55 describes them in the alternative/exclusive, e.g., "**or**", rather than inclusive, "and", as a choice between IFFT **or** IFDT that is similarly discussed in parent patent '703 and priority document 60/634102 ([0022]) in the alternative. This same limitation was added in 12/684650 in amendment filed 12/1/2010 (e.g. not co-filed with filing of original application) that became claim 9 of 7990842.

Regarding claim 25, their cited support of FIG. 2 does not describe newly recited limitation "each of which is coupled to a **transmitter**."

Regarding claim 26, their cited support of FIG. 2 does not describe newly recited limitation "wherein an input of the signal generator is operatively coupled to a **frequency-domain windower**."

Regarding claim 27, their cited support of FIG. 2 does not describe newly recited limitation "wherein an output of the Inverse Fourier Transformer is operatively coupled to a **time-domain windower**" especially in light that '842 describes output of the IFFT is coupled to a serial-to-parallel module.

Regarding claim 28, their cited support of FIG. 2 does not describe newly recited limitation "wherein an output of the time-domain windower is operatively coupled to at least one **digital-to-analog converter**."

Regarding claim 29, their cited support of FIG. 2 does not describe newly recited limitation "coupled to a **digital transmit filter**" in light that parent '703 and 60/634102 do not describe device as recited herein.

Regarding claim 30, lacking evidence to the contrary, their cited support of FIG. 2 on page 11 of remarks in cited amendment does not describe new limitation "coupled to a **parallel-to-serial convertor**" as recited herein in light that parent '703 and 60/634102 do not describe device as recited herein and where serial-to-parallel converter and parallel-to-serial converter devices are not a same device but instead perform opposite function/processing.

Further, regarding claims noted herein, their cited support does not describe the recited limitations noted above especially in light that neither parent patent '703, 60/634102 or 60/591104 describe these new limitations in manner presently recited.

Applicant is required to cancel the new matter in the reply to this Office Action.

Lacking evidence to the contrary, the added material which is not supported by the original disclosure includes the changes made to the specification for the current changes to paragraphs (see MPEP 1412.01) -

beginning at column 2, line 29 to add "except for the subcarrier 0" since lacking evidence to the contrary, '842 describes "except the o-index sub-carrier **which is set to 0**" rather than only "except for the subcarrier 0" as recited herein where lacking "**which is set to 0**," the value of 0-index sub-carrier is undefined herein such that it is broader than '842 disclosure and it is noted claim 22 limits value of sub-carrier 0 which is set to 0,

beginning at column 2, line 59 to omit "more than" where there is no explanation for this omission and in light that '703 and priority document 60/634102 ([0008]-[0011]) describes "more than",

beginning at column 3, line 4 to omit "more than" where there is no explanation for this omission and in light that '703 and priority document 60/634102 ([0008]-[0011]) describes "more than",

beginning at column 4, line 30 to omit "serial to", to add/replace with "to serial", to omit "Serial to parallel", to add/replace with "Parallel to serial", to omit "serial time domain", to add/replace with "parallel", to omit "parallel" and to add/replace with "serial" where there is no support in '842 for the numerous changes regarding modules 208, 210, 308 and 310 especially in light that parent patent '703 and 60/634102 @ paragraphs [0021]-[0024] does not describe the modules 208, 210, 308 and 310 as recited herein and where serial-to-parallel converter and parallel-to-serial converter devices are not a same device but instead perform opposite/reverse function/processing,

beginning at column 4, line 65 to omit "parallel to", to add "to parallel", to omit "Parallel to serial", to add "Serial to parallel", to omit "serial time domain", to omit "the serial time domain" to add/replace with "these" where there is no support in '842 for the numerous changes regarding modules 208, 210, 308 and 310 especially in light that '703 and 60/634102 @ paragraphs [0021]-[0024] does not describe the modules 208, 210, 308 and 310 as recited herein and where serial-to-parallel converter and parallel-to-serial converter devices are not a same device but instead perform opposite/reverse function/processing.

Further, regarding changes to the specification, their cited support in '842 does not appear to describe the changes made to the specification for newly recited changes noted above

especially in light that neither 60/634102 or 60/591104 describe these new changes in manner presently recited.

Lacking evidence to the contrary, the priority documents do not appear to support claim of priority for present changes to specification and claims for similar reasons above.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

10. The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

11. **Claims 1, 4, 8-21 and 23-30 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement.** The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for applications subject to pre-AIA 35 U.S.C. 112, the inventor(s), at the time the application was filed, had possession of the claimed invention. See MPEP 1412.01.

Regarding claim 1, lacking evidence to the contrary, '842 describes "except the 0-index sub-carrier which is set to 0" rather than only "excluding indexed sub-carrier 0" as recited herein where lacking reciting "**which is set to 0**," the value of 0-index sub-carrier is undefined herein so that the claim 1 presently is broader than '842 disclosure in that '842 only describes subcarrier 0

as set to 0, but claim 1 as now recited allows any value. The value of sub-carrier 0 not being limited to zero is not described in '842 to reasonably convey to an artisan that inventor was in possession of invention as recited herein. There is no basis in '842 or its parent patent for "excluding indexed sub-carrier 0" as recited herein and their stated support of FIG 4 does not reasonably convey to an artisan that inventor was in possession of invention as recited herein. It is noted claim 22 limits value of sub-carrier 0 which is set to 0; while, claim 23 depends therefrom.

Regarding claims 10 and 23, lacking evidence to the contrary, FIG. 1 and any other portion of '842 does not describe newly recited limitation "a monitor" as a communications device; although, '842 describes a modem as a communications device and Applicant does not submit evidence their recited monitor operates as a communications device.

Regarding claims 9 and 23, lacking evidence to the contrary, their cited support of FIG. 1 and listed claims on page 11 of remarks in cited amendment and any other portion of '842 does not describe newly recited limitation "wherein: the Inverse Fourier Transformer comprises at least one of the following: an Inverse Fast Fourier Transformer **and** an Inverse Discrete Fourier Transformer" to reasonably convey to an artisan that inventor was in possession of invention as recited herein especially in light that '703 @ 4:37-39 describes them in the alternative, "or", rather than inclusive "and", as a choice between IFFT or IFDT that is similarly discussed in priority document 60/634102 @ [0022] in the alternative, "or". This same limitation was added in 12/684650 in amendment filed 12/1/2010 (e.g. not co-filed with filing of original application) that became claim 9 of 7990842.

Regarding claim 30, lacking evidence to the contrary, their cited support of FIG. 2 on page 11 of remarks in cited amendment and any other portion of '842 does not describe newly

recited limitation "coupled to a parallel-to-serial convertor" and does not reasonably convey to an artisan that inventor was in possession of invention as recited herein in light that parent '703 and 60/634102 do not describe device as recited herein.

Lacking evidence to the contrary, the added material which is not supported by the original disclosure includes the changes made to the specification for the current changes to paragraphs (see MPEP 1412.01) -

beginning at column 2, line 29 to add "except for the subcarrier 0" since lacking evidence to the contrary, '842 describes "except the o-index sub-carrier **which is set to 0**" rather than only "except for the subcarrier 0" as recited herein where lacking "**which is set to 0**," the value of 0-index sub-carrier is undefined herein where a value of 0-sub-carrier not being 0 is not described in '842 to reasonably convey to an artisan that inventor was in possession of invention as recited herein such that this change is broader than '842 disclosure and it is noted claim 22 limits value of sub-carrier 0 which is set to 0,

beginning at column 2, line 59 to omit "more than" where there is no explanation for this omission and in light that '703 and priority document 60/634102 ([0008]-[0011]) describes "more than" where this change is not described in '842 to reasonably convey to an artisan that inventor was in possession of invention as now described,

beginning at column 3, line 4 to omit "more than" where there is no explanation for this omission and in light that '703 and priority document 60/634102 ([0008]-[0011]) describes "more than" where this change is not described in '842 to reasonably convey to an artisan that inventor was in possession of invention as now described,

beginning at column 4, line 30 to omit "serial to", to add/replace with "to serial", to omit "Serial to parallel", to add/replace with "Parallel to serial", to omit "serial time domain", to add/replace with "parallel", to omit "parallel" and to add/replace with "serial" where there is no support in '842 for the numerous changes regarding modules 208, 210, 308 and 310 especially in light that parent patent '703 and 60/634102 @ paragraphs [0021]-[0024] does not describe the modules 208, 210, 308 and 310 as recited herein where these changes are not described in '842 to reasonably convey to an artisan that inventor was in possession of invention as now described and where serial-to-parallel converter and parallel-to-serial converter devices are not a same device but instead perform opposite/reverse function/processing,

beginning at column 4, line 65 to omit "parallel to", to add "to parallel", to omit "Parallel to serial", to add "Serial to parallel", to omit "serial time domain", to omit "the serial time domain" to add/replace with "these" where there is no support in '842 for the numerous changes regarding modules 208, 210, 308 and 310 especially in light that '703 and 60/634102 @ paragraphs [0021]-[0024] does not describe the modules 208, 210, 308 and 310 as recited herein where these changes are not described in '842 to reasonably convey to an artisan that inventor was in possession of invention as now described and where serial-to-parallel converter and parallel-to-serial converter devices are not a same device but instead perform opposite/reverse function/processing.

Further, regarding changes to the specification, their cited support in '842 does not appear to describe the changes made to the specification for newly recited changes noted above especially in light that neither 60/634102 or 60/591104 describe these new changes in manner presently recited.

12. The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

13. **Claims 10 and 23 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor (or for applications subject to pre-AIA 35 U.S.C. 112, the applicant), regards as the invention**. It is confusing or unclear as to how their monitor operates as a communications device as recited herein and Applicant does not submit evidence their recited monitor operates as a communications device.

Reissue Applications

14. **Claims 1, 4, 8-21 and 24-30 are rejected under 35 U.S.C. 251 as being broadened in a reissue application filed outside the two year statutory period**. '842 issued on 8/2/2011 but is a CON of parent Patent 7646703 which issued on 1/12/2010. This reissue application was filed on 11/18/2019. These dates show this reissue is beyond the two year statutory period permitted for broadening. Further, in this case, lacking evidence to the contrary, although claim 1 added limitations cited above, the present limitation "excluding indexed sub-carrier 0" as recited in claim 1 lacks reciting "**which is set to 0**" as described in '842. Thus, the value of 0-index sub-carrier in claim 1 *is undefined herein so it is broader than '842 (i.e., as also described in '703 and priority application 60/634102) disclosure*. The value of sub-carrier 0 not being limited to zero is not described in '842. There is no basis in '842 or its parent patent for

"excluding indexed sub-carrier 0" as recited herein and their stated support of FIG 4 does not reasonably convey to an artisan that inventor was in possession of invention as recited herein and excluding indexed sub-carrier 0 appears to improperly broaden beyond two year statutory period in light that subcarrier 0 has no defined value. It is noted claim 22 correctly limits value of sub-carrier 0 which is set to 0; while, claim 23 depends therefrom.

Likewise, regarding claim 30, lacking evidence to the contrary, their cited support of FIG. 2 on page 11 of remarks in cited amendment and any other portion of '842 does not describe newly recited limitation "coupled to a parallel-to-serial convertor" and does not reasonably convey to an artisan that inventor was in possession of invention as recited herein especially in light that parent '703 and 60/634102 do not describe device as recited herein and where serial-to-parallel converter and parallel-to-serial converter devices are not a same device but instead perform opposite/reverse function/processing.

The reissue claims must be for the same invention as that **disclosed** as being the invention in the original patent, as required by 35 USC 251. The entire disclosure, not just the claim(s), is considered in determining what the patentee objectively intended as the invention. The proper test as to whether reissue claims are for the same invention as that disclosed as being the invention in the original patent is "an essentially factual inquiry confined to the objective intent manifested by the **original patent**." *In re Amos,* 953 F.2d 613, 618, 21 USPQ2d 1271, 1274 (Fed. Cir. 1991) (quoting *In re Rowand,* 526 F.2d 558, 560, 187 USPQ 487, 489 (CCPA 1975)) (emphasis added); See also *In re Mead,* 581 F.2d 251, 256, 198 USPQ 412, 417 (CCPA 1978) ("Thus, in *Rowand* and similar cases, 'intent to claim' has little to do with 'intent' per se, but rather is analogous to the requirement of § 112, first paragraph, that the specification contain 'a written description of the invention, and of the manner and process of making and using it.'"). See MPEP 1412.01.

A claim is broader in scope than the original claims if it contains within its scope any conceivable product or process which would not have infringed the original patent. A claim is broadened if it is broader in any one respect even though it may be narrower in other respects.

15. **The reissue oath/declaration filed with this application is defective because the error which is relied upon to support the reissue application is not an error upon which a reissue can be based. See 37 CFR 1.175 and MPEP § 1414**. The declaration states

> "The specification as issued incorrectly describes (i) module 208 of FIG. 2 as a serial to parallel module and (ii) module 308 of FIG. 3 as a parallel to serial module. This reissue application amends the specification to correctly describe (i) module 208 as a parallel to serial module and (ii) module 308 as a serial to parallel module." Declaration, filed 11/18/2019.

However, the declaration herein fails to declare how/why the above changes to the modules 208 and 308 renders the patent to be wholly or partially inoperative or invalid as required by 37 CFR 1.175 and 35 USC 251. Also, a serial-to-parallel converter and parallel-to-serial converter are not a same device but instead perform reverse/opposite function/processing such that present amendment to swap one device for the other is inconsistent with disclosure in 842, '703 and 60/63412, as each originally filed. Thus, it is unclear what error that renders the patent partially or wholly inoperative or invalid is relied on for this reissue.

16. **Claims 1, 4, and 8-30 are rejected as being based upon a defective reissue declaration by the inventor under 35 U.S.C. 251 as set forth above**. See 37 CFR 1.175.

Conclusion

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Sager whose telephone number is (571)272-4454. The examiner can normally be reached on M-Th, 7:30am-4pm, EST.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at

http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexander Kosowski can be reached on (571)272-3744. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Mark Sager/
Primary Examiner, Art Unit 3992

Conferee(s):

/FRED O FERRIS III/
Reexamination Specialist, Art Unit 3992

/ALEXANDER J KOSOWSKI/
Supervisory Patent Examiner, Art Unit 3992

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/686,468	Trachewsky et al.
	Examiner	Art Unit
	MARK A SAGER	3992

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/10/2021								
	1	✓								
	2	-								
	3	-								
	4	✓								
	5	-								
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	7	-								
	8	✓								
	9	✓								
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	27	✓								
	28	✓								
	29	✓								
	30	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/686,468	Trachewsky et al.
	Examiner	Art Unit
	MARK A SAGER	3992

CPC - Searched*		
Symbol	Date	Examiner
H04L27/2613, H04L27/262, H04L5/0048, H04L25/0226, H04B2201/70701, H04B2201/70706	03/11/2021	ms

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Lit Search	02/13/2020	ms
reviewed 7990842 and 7646703 file history	03/08/2021	ms
PE2E Search	03/10/2021	ms

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	2	("7990842" "7646703").PN.	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/09 08:03 AM
L2	10	("7203245" | "7254171" | "7394865" | "20040008803" | "20040264585" | "20050265219" | "20060209890" | "20060209892" | "20070002749" | "20070047671").pn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB ; USPAT ; USOCR)	OR	ON	ON	2021/03/09 09:03 AM
L3	2	("7990842" "7646703").PN. AND map$	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/09 09:03 AM
L4	2	("7990842" "7646703").PN. AND (processor monitor)	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/09 10:03 AM
L5	2	("7990842" "7646703").PN. AND (expanded extended)	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/09 02:03 PM
L6	2	("7990842" "7646703").PN. AND window$	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/09 02:03 PM
L7	2	("7990842" "7646703").PN. AND (receiver transmitter transceiver)	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/10 07:03 AM
L8	5147759	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence AND @ad<=20040727 OR @ad<20041208	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/10 04:03 PM
L9	5147759	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 AND @ad<=20040727 OR @ad<20041208	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/10 04:03 PM
L10	5147759	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 WITH (IFT inverse ADJ fourier) AND @ad<=20040727 OR @ad<20041208	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/10 04:03 PM
L11	5147759	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 WITH (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND @ad<=20040727 OR @ad<20041208	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/10 04:03 PM

L12	5147765	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 WITH (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND (orthogonal ADJ frequency OFDM) @ad<=20040727 OR @ad<20041208	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/10 04:03 PM
L13	0	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 WITH (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND (orthogonal ADJ frequency OFDM) AND (@ad<=20040727 OR @ad<20041208)	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/10 04:03 PM
L14	0	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 WITH (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND (orthogonal ADJ frequency OFDM) AND (@ad<=20040727 OR @ad<20041208)	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/10 04:03 PM
L15	0	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 WITH (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND (@ad<=20040727 OR @ad<20041208)	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/10 04:03 PM
L16	106	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 AND (@ad<=20040727 @ad<20041208)	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/10 04:03 PM
L17	0	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 WITH (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND (@ad<=20040727 @ad<20041208)	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/10 04:03 PM

L18	1195	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence AND (@ad<=20040727 @ad<20041208)	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/10 04:03 PM
L19	3	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 AND (IFT inverse ADJ fourier) AND (@ad<=20040727 @ad<20041208)	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/10 04:03 PM
L20	3	(expand$3 extend$3 elong$5 long$4) WITH train$3 WITH sequence WITH generat$3 AND (IFT inverse ADJ fourier) AND (legacy standard) AND (peak minimal minimum average ratio) AND (@ad<=20040727 @ad<20041208)	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/10 04:03 PM
L21	7152	(H04L27/2613).cpc.	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/11 08:03 AM
L22	454	(H04L27/262).cpc.	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/11 08:03 AM
L23	21308	(H04L5/0048).cpc.	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/11 08:03 AM
L24	3519	(H04L25/0226).cpc.	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/11 08:03 AM
L25	1704	(H04B2201/70701).cpc.	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/11 08:03 AM
L26	479	(H04B2201/70706).cpc.	(US-PGPUB ; USPAT)	OR	ON	ON	2021/03/11 08:03 AM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16686468
Filing Date	2019-11-18
First Named Inventor	Jason Alexander Trachewsky
Art Unit	3992
Examiner Name	Hetul B. Patel
Attorney Docket Number	1382.001RE

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7453793	B1	2008-11-18	Jones, IV et al.	
	2	7318185	B2	2008-01-08	Khandani et al.	
	3	7742388	B2	2010-06-22	Shearer et al.	
	4	5479444	A	1995-12-26	Malkamaki et al.	
	5	6438173	B1	2002-08-20	Stantchev	
	6	7324605	B2	2008-01-29	Maltsev et al.	
	7	7349436	B2	2008-03-25	Maltsev et al.	
	8	7433418	B1	2008-10-07	Dogan et al.	

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	9	7444134	B2	2008-10-28	Hansen et al.	
	10	7599332	B2	2009-10-06	Zelst et al.	
	11	7392015	B1	2008-06-24	Farlow et al.	
	12	5914933	A	1999-06-22	Cimini et al.	
	13	7539260	B2	2009-05-26	van Zelst et al.	
	14	8457232	B2	2013-06-04	van Zelst et al.	
	15	7394865	B2	2008-07-01	Borran et al.	
	16	7254171	B2	2007-08-07	Hudson	
	17	7203245	B1	2007-04-10	Murphy	
	18	7646703	B2	2010-01-12	Trachewsky et al.	
	19	8477594	B2	2013-07-02	Trachewsky et al.	

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	20	8792432	B2	2014-07-29	Martin et al.	
	21	6941156	B2	2005-09-06	Mooney	
	22	8416862	B2	2013-04-09	Aldana et al.	
	23	8204554	B2	2012-06-19	Goris et al.	
	24	7319889	B2	2008-01-15	Goris et al.	

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	1	20070047671	A1	2007-03-01	Chen	
	2	20070002749	A1	2007-01-04	Sondur et al.	
	3	20060209892	A1	2006-09-21	MacMullan et al.	
	4	20060209890	A1	2006-09-21	MacMullan et al.	

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	5	20050265219	A1	2005-12-01	Murphy et al.	
	6	20040264585	A1	2004-12-30	Borran et al.	
	7	20040008803	A1	2004-01-15	Aldrovandi et al.	*-
	8	20060120447	A1	2006-06-08	Trachewsky et al.	
	9	20100110876	A1	2010-05-06	Trachewsky et al.	
	10	20040093545	A1	2004-05-13	Khandani et al.	
	11	20050286474	A1	2005-12-29	van Zelst et al.	
	12	20070060073	A1	2007-03-15	Boer et al.	
	13	20060002361	A1	2006-01-05	Webster et al.	
	14	20050233709	A1	2005-10-20	Gardner et al.	
	15	20030043887	A1	2003-03-06	Hudson	

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	1	WO2004030265	WO	A1	2004-04-08	Kabushiki Kaisha Toshiba		

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	"Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: High-speed Physical Layer in the 5 GHZ Band," IEEE Std 802. 11a-1999 (Supplement to IEEE Std 802.11-1999), December 30, 1999, pp. 1-90, IEEE, United States.	
	2	OGAWA, YASUTAKA et al. "A MIMO-OFDM System for High-Speed Transmission," 2003 IEEE 58th Vehicular Technology Conference, October 9, 2003, pp. 493-497, IEEE, Orland, United States.	
	3	ABHAYAWARDHANA, V. S. et al., "Frequency Scaled Time Domain Equalization for OFDM in Broadband Fixed Wireless Access Channels," 2002 IEEE Wireless Communications and Networking Conference Record, March 21, 2002, pp. 67-72, IEEE, Orland, United States.	
	4	LIEBETREU, JOHN et al., "Modifications to OFDM FFT-256 mode for supporting mobile operation," IEEE C802.16e-03/12, March 3, 2003, pp.0-8, IEEE.	

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EXAMINER SIGNATURE

Examiner Signature	/MARK SAGER/	Date Considered	03/09/2021

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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	1	Decision: Settlement Prior to Institution of Trial; IPR 2019-01174; dated December 11, 2019.
	2	Decision: Settlement Prior to Institution of Trial; IPR 2019-01345; dated December 11, 2019.
	3	Decision: Settlement Prior to Institution of Trial; IPR 2019-01437; dated December 11, 2019.
	4	Order Granting Joint Motion for Dismissal as to Counts III and IV of BNR's Complaint and Partial Dismissal of Counts I and II of Coolpad's Counterclaims; C.A. No. 3:18-cv-1783-CAB-BLM; dated October 7, 2019.
	5	Order Granting Joint Morion to Dismiss; Case No.: 18-CV-1785-CAB-BLM; dated August 5, 2019.
	6	Order Granting Joint Motion for Dismissal as to Counts 3 and 6 of BNR's Amended Complaint and Counts VI, VII, X, and XI of ZTE Corporation, ZTE (TX), Inc., and ZTE (USA) Inc.'s Counterclaims; C.A. No. 3:18-cv-1786-CAB-BLM; dated October 4, 2019.
	7	Order Granting Joint Motion for Dismissal as to Counts III and VI of BNR's Second Amended Complaint; C.A. No. 3:18-cv-1784-CAB-BLM; dated October 21, 2019.

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	Examiner Name	Mark Alan Sager
	Attorney Docket Number	1382.001RE

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Steve Mendelsohn/	Date (YYYY-MM-DD)	2020-05-12
Name/Print	Steve Mendelsohn	Registration Number	35951

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	39417120
Application Number:	16686468
International Application Number:	
Confirmation Number:	2785
Title of Invention:	Backward-Compatible Long Training Sequences for Wireless Communication Networks
First Named Inventor/Applicant Name:	Jason Alexander Trachewsky
Customer Number:	22186
Filer:	Steve Mendelsohn/Eri Yoneda
Filer Authorized By:	Steve Mendelsohn
Attorney Docket Number:	1382.001RE
Receipt Date:	12-MAY-2020
Filing Date:	18-NOV-2019
Time Stamp:	14:00:24
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	1382_001RE_IDS_Form_2020-05-12.pdf	25243 c15677d24fb3c253deebea86ec833e9b815d2d22	no	2

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	1382_001RE_PTOSB08a.pdf	612531 0356ad68e84a7abe4526f7cd067f8877439bce39	no	4
Warnings:					
Information:					
A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
3	Non Patent Literature	IPR2019-01174_2019-12-11_Order_Terminating_Proceeding.pdf	71953 06f447d7d0d4993477046b4e51e141f3a98aae45	no	4
Warnings:					
Information:					
4	Non Patent Literature	IPR2019-01345_2019-12-11_Order_Terminating_Proceeding.pdf	894885 f335e3ff35fd95b2987602a062d2cc0367e1981c	no	3
Warnings:					
Information:					
5	Non Patent Literature	IPR2019-01437_2019-12-11_Order_Terminating_Proceeding.pdf	680132 da6f227a268368e5a5870e46b09be555635b5e4e	no	8
Warnings:					
Information:					
6	Non Patent Literature	2019_10_08_D98_Order_Granting_Joint_Motion.pdf	310285 58bf45c73f81f1021fef27526c38ad9acaca6ab7	no	1
Warnings:					
Information:					
7	Non Patent Literature	2019-08-05_D75_Order_granting_Joint_MTD_Kyocera.pdf	336442 60cdd4330b2a11acf2becc7a5c5e5823ab2bc6c6	no	2
Warnings:					
Information:					

8	Non Patent Literature	2019-10-04_D127_Order_Granting_Joint_Motion_for_Dismissal.pdf	291528 ec80a821eb8849e9d76bf1fdc2a7a98456aceaf8	no	1
Warnings:					
Information:					
9	Non Patent Literature	2019-10-21_D121_Order_granting_Joint_MTD_842_156_Huawei.pdf	290584 e4ccd03cfed857859774d3a0448b68108cd89d60	no	1
Warnings:					
Information:					
		Total Files Size (in bytes):	3513583		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. 1382.001RE

In re application of: Jason Alexander Trachewsky and Rajendra R. Moorti

Serial No.:	16/686,468	Group No.	3992
Filed:	11/18/2019	Examiner:	Mark Alan Sager
		Phone No.:	(571)272-4454

For: Backward-Compatible Long Training Sequences for Wireless Communication Networks

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In accordance with 37 CFR § 1.56, this is an Information Disclosure Statement (IDS) for the above-captioned U.S. patent application. An IDS Form PTO/SB/08a listing references is enclosed herewith and forms a part hereof. Submission of references is not an admission that those references are in fact prior art.

Certification Under 37 CFR § 1.704(d)

[ ] Each item of information contained in this information disclosure statement: (1) was first cited in any communication from a patent office in a counterpart foreign or international application or from the USPTO, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of this information disclosure statement; or (2) is a communication that was issued by a patent office in a counterpart foreign or international application or by the USPTO, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of this information disclosure statement. (See the attached PTO/SB/133)

Certification Under 37 CFR § 1.97(e)

[ ] (1) Each item of information contained in this information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement.

[ ] (2) No item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of this information disclosure statement.

Fee Under 37 CFR § 1.97(c)

[ ] The fee for submission of this IDS under § 1.97(c) is $240.00 as set forth in § 1.17(p).

Fee Under 37 CFR § 1.97(d)

[ ] The fee for submission of this IDS under § 1.97(d) is $240.00 as set forth in § 1.17(p).

Submission Under 37 CFR § 1.97(i)

[ ] This IDS is being submitted under § 1.97(i). Please place the IDS in the file pursuant to § 1.97(i).

Provision of Copies of Non-Patent Literature (NPL)/Foreign References

[X] Copies of the NPL references are enclosed herewith and form a part hereof.

[ ] Copies of the foreign references are enclosed herewith and form a part hereof.

[ ] The English abstract of reference _____ is enclosed herewith and forms a part hereof.

[ ] A copy of the International Search Report from a corresponding PCT application is enclosed herewith.

[ ] A copy of the European Search Report from a corresponding EPO application is enclosed herewith.

[ ] A copy or copies of one or more U.S. office actions and/or a notice of allowance for U.S. patent application no. _____ filed on _____ as attorney docket no. _____ is/are enclosed herewith.

[ ] The above-captioned U.S. patent application is a
[ ] continuation
[ ] divisional
[ ] continuation-in-part

application of U.S. application serial number_____, filed on _____as Attorney Docket No. _____. Each of the listed references except the office actions and/or notice of allowance from such prior application was previously cited by or submitted to the Office in the prior application. The above-captioned U.S. patent application relies upon the prior application for an earlier filing date under 35 U.S.C. 120. Pursuant to § 1.98(d), copies of such listed references are not being provided with this IDS.

Authorization to Charge Credit Card Account

[ ] Electronic credit card payment is being made in the amount of $ 240.00.

Authorization to Charge Deposit Account

[X] Authorization is given to charge Mendelsohn Dunleavy, P.C. Deposit Account No. 50-0782 any deficiency or credit any overpayment for any fee under § 1.97(c) or § 1.97(d).

It is respectfully requested that the Examiner initial and return a copy of the enclosed PTO/SB/08a form as confirmation that each of the documents has been considered.

Respectfully submitted,

Date: 05/12/2020
Customer No. 22186
Mendelsohn Dunleavy, P.C.
1500 John F. Kennedy Blvd., Suite 312
Philadelphia, Pennsylvania 19102

/Steve Mendelsohn/
Steve Mendelsohn
Registration No. 35,951
Attorney for Applicant
(215) 557-6657

Enclosures

NXP - Exhibit 1004 - Page 130

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	16686468
Filing Date	2019-11-18
First Named Inventor	Jason Alexander Trachewsky
Art Unit	3992
Examiner Name	Hetul B. Patel
Attorney Docket Number	1382.001RE

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7453793	B1	2008-11-18	Jones, IV et al.	
	2	7318185	B2	2008-01-08	Khandani et al.	
	3	7742388	B2	2010-06-22	Shearer et al.	
	4	5479444	A	1995-12-26	Malkamaki et al.	
	5	6438173	B1	2002-08-20	Stantchev	
	6	7324605	B2	2008-01-29	Maltsev et al.	
	7	7349436	B2	2008-03-25	Maltsev et al.	
	8	7433418	B1	2008-10-07	Dogan et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	First Named Inventor	Jason Alexander Trachewsky
	Art Unit	3992
	Examiner Name	Hetul B. Patel
	Attorney Docket Number	1382.001RE

	9	7444134	B2	2008-10-28	Hansen et al.	
	10	7599332	B2	2009-10-06	Zelst et al.	
	11	7392015	B1	2008-06-24	Farlow et al.	
	12	5914933	A	1999-06-22	Cimini et al.	
	13	7539260	B2	2009-05-26	van Zelst et al.	
	14	8457232	B2	2013-06-04	van Zelst et al.	
	15	7394865	B2	2008-07-01	Borran et al.	
	16	7254171	B2	2007-08-07	Hudson	
	17	7203245	B1	2007-04-10	Murphy	
	18	7646703	B2	2010-01-12	Trachewsky et al.	
	19	8477594	B2	2013-07-02	Trachewsky et al.	

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	Examiner Name	Hetul B. Patel
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	20	8792432	B2	2014-07-29	Martin et al.	
	21	6941156	B2	2005-09-06	Mooney	
	22	8416862	B2	2013-04-09	Aldana et al.	
	23	8204554	B2	2012-06-19	Goris et al.	
	24	7319889	B2	2008-01-15	Goris et al.	

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20070047671	A1	2007-03-01	Chen	
	2	20070002749	A1	2007-01-04	Sondur et al.	
	3	20060209892	A1	2006-09-21	MacMullan et al.	
	4	20060209890	A1	2006-09-21	MacMullan et al.	

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	First Named Inventor	Jason Alexander Trachewsky
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	Examiner Name	Hetul B. Patel
	Attorney Docket Number	1382.001RE

	5	20050265219	A1	2005-12-01	Murphy et al.	
	6	20040264585	A1	2004-12-30	Borran et al.	
	7	20040008803	A1	2004-01-15	Aldrovandi et al.	*-
	8	20060120447	A1	2006-06-08	Trachewsky et al.	
	9	20100110876	A1	2010-05-06	Trachewsky et al.	
	10	20040093545	A1	2004-05-13	Khandani et al.	
	11	20050286474	A1	2005-12-29	van Zelst et al.	
	12	20070060073	A1	2007-03-15	Boer et al.	
	13	20060002361	A1	2006-01-05	Webster et al.	
	14	20050233709	A1	2005-10-20	Gardner et al.	
	15	20030043887	A1	2003-03-06	Hudson	

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Application Number	16686468
Filing Date	2019-11-18
First Named Inventor	Jason Alexander Trachewsky
Art Unit	3992
Examiner Name	Hetul B. Patel
Attorney Docket Number	1382.001RE

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	WO2004030265	WO	A1	2004-04-08	Kabushiki Kaisha Toshiba		

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	'Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: High-speed Physical Layer in the 5 GHZ Band," IEEE Std 802. 11a-1999 (Supplement to IEEE Std 802.11-1999), December 30, 1999, pp. 1-90, IEEE, United States.	
	2	OGAWA, YASUTAKA et al. "A MIMO-OFDM System for High-Speed Transmission," 2003 IEEE 58th Vehicular Technology Conference, October 9, 2003, pp. 493-497, IEEE, Orland, United States.	
	3	ABHAYAWARDHANA, V. S. et al., "Frequency Scaled Time Domain Equalization for OFDM in Broadband Fixed Wireless Access Channels," 2002 IEEE Wireless Communications and Networking Conference Record, March 21, 2002, pp. 67-72, IEEE, Orland, United States.	
	4	LIEBETREU, JOHN et al., "Modifications to OFDM FFT-256 mode for supporting mobile operation," IEEE C802.16e-03/12, March 3, 2003, pp.0-8, IEEE.	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	Filing Date	2019-11-18
	First Named Inventor	Jason Alexander Trachewsky
	Art Unit	3992
	Examiner Name	Hetul B. Patel
	Attorney Docket Number	1382.001RE

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	Application Number	16686468
	Filing Date	2019-11-18
	First Named Inventor	Jason Alexander Trachewsky
	Art Unit	3992
	Examiner Name	Hetul B. Patel
	Attorney Docket Number	1382.001RE

CERTIFICATION STATEMENT

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OR

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☒ A certification statement is not submitted herewith.

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Signature	/Steve Mendelsohn/	Date (YYYY-MM-DD)	2020-03-13
Name/Print	Steve Mendelsohn	Registration Number	35951

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1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

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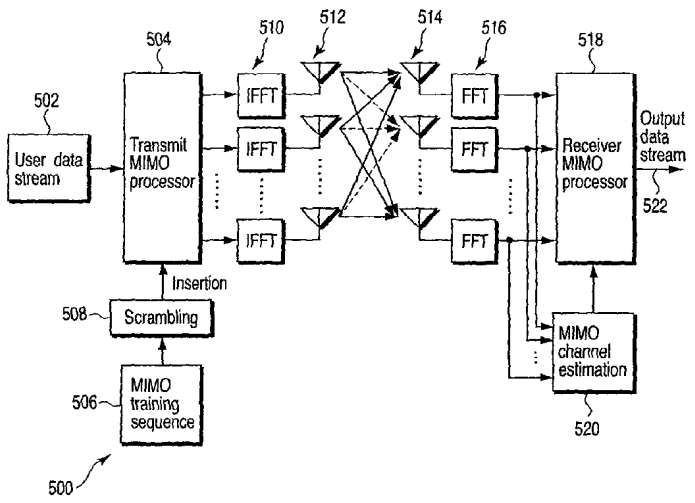
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(54) Title: CHANNEL ESTIMATION FOR OFDM USING ORTHOGONAL TRAINING SEQUENCES



(57) Abstract: This invention relates to apparatus, methods, processor control code and signals for channel estimation in OFDM (Orthogonal Frequency Division Multiplexed) communication systems with a plurality of transmitter antennas, such as MIMO (Multiple-input Multiple-output) OFDM systems. An OFDM signal is transmitted from an OFDM transmitter using a plurality of transmit antennas. The OFDM signal is adapted for channel estimation for channels associated with the transmit antennas by the inclusion of orthogonal training sequence data in the signal from each the antenna. The training sequence data is derived from substantially orthogonal training sequences of length K for each the transmit antenna, the orthogonal training sequences being constructed such that a minimum required sequence length K needed to determine a channel estimate for at least one channel associated with each the transmit antenna is linearly dependent upon the number of the transmit antennas.

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D E S C R I P T I O N

TRANSMISSION SIGNALS, METHODS AND APPARATUS

Technical Field

This invention relates to apparatus, methods, processor control code and signals for channel estimation in OFDM (Orthogonal Frequency Division Multiplexed) communication systems. More particularly it relates to channel estimation in systems with a plurality of transmitter antennas, such as MIMO (Multiple-input Multiple-output) OFDM systems.

Background Art

The current generation of high data rate wireless local area network (WLAN) standards, such as Hiperlan/2 and IEEE802.11a, provide data rates of up to 54 Mbit/s. However, the ever-increasing demand for even higher data rate services, such as Internet, video and multi-media, have created a need for improved bandwidth efficiency from next generation wireless LANs. The current IEEE802.11a standard employs the bandwidth efficient scheme of Orthogonal Frequency Division Multiplex (OFDM) and adaptive modulation and demodulation. The systems were designed as single-input single-output (SISO) systems, essentially employing a single transmit and receive antenna at each end of the link. However within ETSI BRAN some

provision for multiple antennas or sectorised antennas has been investigated for improved diversity gain and thus link robustness.

Hiperlan/2 is a European standard for a 54 Mbps wireless network with security features, operating in the 5 GHz band. IEEE 802.11 and, in particular, IEEE 802.11a, is a US standard defining a different networking architecture, but also using the 5 GHz band and providing data rates of up to 54 Mbps. The Hiperlan (High Performance Radio Local Area Network) type 2 standard is defined by a Data Link Control (DLC) Layer comprising basic data transport functions and a Radio Link Control (RLC) sublayer, a Packet based Convergence Layer comprising a common part definition and an Ethernet Service Specific Convergence Sublayer, a physical layer definition and a network management definition. For further details of Hiperlan/2 reference may be made to the following documents, which are hereby incorporated by reference: ETSI TS 101 761-1 (V1.3.1): "Broadband Radio Access Networks (BRAN); HIPERLAN Type 2; Data Link Control (DLC) Layer; Part 1: Basic Data Transport Functions"; ETSI TS 101 761-2 (V1.2.1): "Broadband Radio Access Networks (BRAN); HIPERLAN Type 2; Data Link Control (DLC) Layer; Part 2: Radio Link Control (RLC) sublayer"; ETSI TS 101 493-1 (V1.1.1): "Broadband Radio Access Networks (BRAN); HIPERLAN Type 2; Packet based Convergence

Layer; Part 1: Common Part"; ETSI TS 101 493-2 (V1.2.1): "Broadband Radio Access Networks (BRAN); HIPERLAN Type 2; Packet based Convergence Layer; Part 2: Ethernet Service Specific Convergence Sublayer (SSCS)"; ETSI TS 101 475 (V1.2.2): "Broadband Radio Access Networks (BRAN); HIPERLAN Type 2; Physical (PHY) layer"; ETSI TS 101 762 (V1.1.1): "Broadband Radio Access Networks (BRAN); HIPERLAN Type 2; Network Management". These documents are available from the ETSI website at www.etsi.org.

A typical wireless LAN (Local Area Network) based on the Hiperlan/2 system comprises a plurality of mobile terminals (MT) each in radio communication with an access point (AP) or base station of the network. The access points are also in communication with a central controller (CC) which in turn may have a link to other networks, for example a fixed Ethernet-type local area network. In some instances, for example in a Hiperlan/2 network where there is no local access point, one of the mobile terminals may take the role of an access point/central controller to allow a direct MT to MT link. However in this specification references to "mobile terminal" and "access point" should not be taken to imply any limitation to the Hiperlan/2 system or to any particular form of access point (or base station) or mobile terminal.

Orthogonal frequency division multiplexing is a

well-known technique for transmitting high bit rate digital data signals. Rather than modulate a single carrier with the high speed data, the data is divided into a number of lower data rate channels each of which is transmitted on a separate subcarrier. In this way the effect of multipath fading is mitigated. In an OFDM signal the separate subcarriers are spaced so that they overlap, as shown for subcarriers 12 in spectrum 10 of Figure 1. The subcarrier frequencies are chosen that so that the subcarriers are mutually orthogonal, so that the separate signals modulated onto the subcarriers can be recovered at the receiver. One OFDM symbol is defined by a set of symbols, one modulated onto each subcarrier (and therefore corresponds to a plurality of data bits). The subcarriers are orthogonal if they are spaced apart in frequency by an interval of 1/T, where T is the OFDM symbol period.

An OFDM symbol can be obtained by performing an inverse Fourier transform, preferably an Inverse Fast Fourier Transform (IFFT), on a set of input symbols. The input symbols can be recovered by performing a Fourier transform, preferably a fast Fourier transform (FFT), on the OFDM symbol. The FFT effectively multiplies the OFDM symbol by each subcarrier and integrates over the symbol period T. It can be seen that for a given subcarrier only one subcarrier from the OFDM symbol is extracted by this procedure, as the

overlap with the other subcarriers of the OFDM symbol will average to zero over the integration period T.

Often the subcarriers are modulated by QAM (Quadrature Amplitude Modulation) symbols, but other forms of modulation such as Phase Shift Keying (PSK) or Pulse Amplitude Modulation (PAM) can also be used. To reduce the effects of multipath OFDM symbols are normally extended by a guard period at the start of each symbol. Provided that the relatively delay of two multipath components is smaller than this guard time interval there is no inter-symbol interference (ISI), at least to a first approximation.

Figure 2 shows an example of a conventional SISO (single-input, single-output) OFDM system including a transmitter 100 (here in a mobile terminal, MT) receiver 150 (here in an access point, AP). In the transmitter 100 a source 102 provides data to a baseband mapping unit 104, which optionally provides forward error correction coding and interleaving, and which outputs modulated symbols such as QAM symbols. The modulated symbols are provided to a multiplexer 108 which combines them with pilot symbols from a pilot symbol generator 106, which provides reference amplitudes and phases for frequency synchronisation and coherent detection in the receiver and known (pilot) data for channel estimation. The combination of blocks 110 converts the serial data stream from multiplexer

108 to a plurality of parallel, reduced data rate streams, performs an IFFT on these data streams to provide an OFDM symbol, and then converts the multiple subcarriers of this OFDM symbol to a single serial data stream. This serial (digital) data stream is then converted to an analogue time-domain signal by digital-to-analogue converter 112, up-converted by up-converter 114, and after filtering and amplification (not shown) output from an antenna 116, which may comprise an omni-directional antenna, a sectorised antenna or an array antenna with beamforming.

In more detail, a series of modulation data symbols such as QAM symbols, is arranged as a vector, optionally padded with zeros to introduce oversampling. This (column) vector is then multiplied by an inverse discrete Fourier transform (IDFT) matrix to provide an output (column) vector comprising a set of values which when passed to a digital-to-analogue converter, one at a time, will define a waveform which effectively comprises a set of orthogonal carriers modulated by the modulation symbols, this being termed an OFDM symbol. In practice (although not shown explicitly in Figure 2) a cyclic extension such as a cyclic prefix is added in the time domain, for example by copying some of the final samples of the IDFT output to the start of the OFDM symbol. This cyclic prefix extends the OFDM symbol (the symbol may be extended at either end) to

provide a guard time which effectively eliminates inter-symbol interference for multipaths delays of less than this guard time. (When decoding the FFT integration time does not begin until after the cyclic prefix guard time). Windowing may also be applied (in the time domain) to reduce the power of out-of-band subcarriers.

The signal from antenna 116 of transmitter 100 is received by an antenna 152 of receiver 150 via a "channel" 118. Typically the signal arrives at antenna 152 as a plurality of multipath components, with a plurality of different amplitudes and phases, which have propagated via a plurality of different channels or paths. These multipath components combine at the receiver and interfere with one another to provide an overall channel characteristic typically having a number of deep nulls, rather like a comb, which generally change with time (particularly where the transmitter or receiver is moving). This is discussed in more detail later.

A particular problem arises where transmit diversity is employed, that is where more than one transmit antenna is used, for example in a MIMO (Multiple-Input Multiple-Output) OFDM communication system, where the "input" (to a matrix channel) is provided by a plurality of transmit antennas and the "output" (from a matrix channel) is provided by a

plurality of receive antennas. In such a communication system, the signals from different transmit antennas may interfere with one another causing decoding difficulties.

The antenna 152 of receiver 150 is coupled to a down-converter 154 and to an analogue-to-digital converter 156. Blocks 158 then perform a serial-to-parallel conversion, FFT, and parallel-to-serial re-conversion, providing an output to demultiplexer 160, which separates the pilot symbol signal 162 from the data symbols. The data symbols then demodulated and de-mapped by base-band de-mapping unit 164 to provide a detected data output 166. Broadly speaking the receiver 150 is a mirror image of the transmitter 100. The transmitter and receiver may be combined to form an OFDM transceiver.

OFDM techniques may be employed in a variety of applications and are used, for example, for military communication systems and high definition TV as well as Hiperlan/2 (www.etsi.org/technicalactiv/hiperlan2.htm, and DTS/BRAN-0023003 v 0.k).

The receiver of Figure 2 is somewhat simplified as, in practice, there is a need to synchronise the FFT window to each OFDM symbol in turn, to avoid introducing non-orthogonality and hence ISI/ICI (Inter-Symbol Interference/Inter-Carrier Interference). This may be done by auto-correlating an OFDM symbol with the

cyclic extension of the symbol in the guard period but it is generally preferable, particularly for packet data transmission, to use known OFDM symbols which the receiver can accurately identify and locate, for example using a matched filter.

Figures 3 and 4 show, respectively, a receiver front end 200 and receiver signal processing blocks 250 of a conventional HIPERLAN 2 mobile terminal (MT) OFDM receiver. The receiver 250 shows some details of the analogue-to-digital conversion circuitry 252, the synchronisation, channel estimation and control circuitry 252 and the de-packetising, de-interleaving and error correcting circuitry 256.

The front end 200 comprises a receive antenna 202 coupled to an input amplifier 204 and a mixer 206, which has a second input from an IF oscillator 208 to mix the RF signal to IF. The IF signal is then provided to an automatic Automatic Gain Control (AGC) amplifier 212 via a band pass filter 210, the AGC stage being controlled by a line 226 from control circuitry 254, to optimise later signal quantisation. The output of AGC 212 provides an input to two mixers 214, 216, which are also provided with quadrature signals from an oscillator 220 and splitter 218 to generate quadrature I and Q signals 222, 224. These I and Q signals are then over-sampled, filtered and decimated by analogue-to-digital circuitry 252. The over-sampling of the

signal aids the digital filtering, after which the signal is rate reduced to the desired sample rate.

In Figure 2 and 4, FFT and IFFT operations may be implemented at least partially in software, as schematically illustrated by Flash RAM 262, for example using one or more digital signal processors (DSPs) and/or one or more ASICs or FPGAs. The exact point at which the signal is digitised in a software radio will generally depend upon a cost/complexity/power consumption trade-off, as well as upon the availability of suitable high speed analogue/digital converters and processor.

A known symbol, for example in preamble data or one or more pilot signals may be used for channel estimation, to compensate for the effects of a transmission channel.

Figure 5 shows a block diagram illustrating the basic concept of one type of channel estimation procedure 270. Embodiments of the invention to be described later are not limited to use with this technique and may be used with other conventional channel estimation techniques, for example Maximum Likelihood Sequence Estimation (MLSE) in which a most probable received sequence is chosen from a set of all possible received sequences. The procedure aims to modify the coefficients of an adaptive digital filter, labelled as "channel estimate" 278 in Figure 5, so that

the behaviour of the filter matches, as closely as possible, the behaviour of a transmission channel 274 being modelled.

A known training signal 272 is applied both to the transmission channel 274 to be modelled and to the adaptive filter 278 providing the channel estimate. The received version of the training signal corresponds to the output 276 from channel 274 and reflects the impulse response of the channel 204. The output 280 from channel estimate adaptive filter 278 comprises the estimated response of the channel, and this is subtracted from the actual response in subtracter 282 to create an error signal 284 which is fed back to the adaptive channel estimate filter 278 to update the coefficients of the filter according to an adaption algorithm.

Any one of many suitable conventional algorithms may be employed, such as a Recursive Least Square (RLS) or Least Mean Square (LMS) algorithm or a variant thereof. Such algorithms will be well-known to the skilled person but, for completeness, an outline description of the LMS algorithm will also be given; reference may also be made to Lee and Messerschmitt, "Digital Communication", Kluwer Academic Publishers, 1994.

Consider an input u(n) where n labels the number or step of an input sample, buffered into an input

vector u(n), a desired filter response d(n), and a vector of estimated filter tap weights w(n). The output of the filter is given by

$$y(n) = w^H(n)\, u(n)$$

where w^H denotes the Hermitian conjugate of w. Then, according to the LMS algorithm, an improved weight estimation is given by

$$w(n+1) = w(n) + \mu\, u(n)[d^*(n) - y^*(n)]$$

where * denotes a complex conjugate and μ is the adaption step size of the algorithm. Convergence of the algorithm can be determined using the mean squared error, that is

$$|d(n) - y(n)|^2$$

which tends to a constant value or 0 as n tends to infinity. In Figure 5 the training signal 272 corresponds to u(n), the received signal 276 to d(n), and the output 280 of channel estimate adaptive filter 278 to y(n).

In the receiver 250 of Figure 4 a known preamble symbol, referred to as the "C symbol", is used to determine a channel estimate. The receiver synchronises to the received signal and switch 258 is operated to pass the received C symbol to channel estimator 260. This estimates the effect of the channel (amplitude change and phase shift of the symbols in the sub-carriers) on the known C symbol so that the effects of the channel can be compensated for,

by multiplying by the reciprocal (or complex conjugate) of the channel response. Alternatively the one or more pilot signals (which also contain known symbols) can be used to determine a channel estimate. Again the phase rotation and amplitude change required to transform the received pilot into the expected symbol can be determined and applied to other received symbols. Where more than one pilot is available at more than one frequency improved channel compensation estimates can be obtained by interpolation/extrapolation to other frequencies using the different frequency pilot signals.

Figure 6 shows a plot 300 in the frequency and time domain illustrating the relative positions of preamble sequences 302, pilot signals 304, and data signals 306 for HIPERLAN 2, which has 48 data sub-carriers and 4 pilots (and one unused, central carrier channel 308). As can be seen from Figure 6 the first four OFDM symbols comprise preamble data, and the pilot signals 304 continue to carry their preamble symbols. However on the remaining (data-bearing) sub-carriers OFDM symbols 5 onwards carry data. In other OFDM schemes similar plots can be drawn, although the preamble and pilot positions may vary (for example, the pilots need not necessarily comprise continuous signals).

The skilled person will appreciate that in general

in wireless LAN packet data communications systems packet lengths are short enough to assume a substantially constant channel over the duration of a packet. For this reason the preamble pilot data 302 can be used for training symbols to obtain channel estimates which may be assumed to be substantially constant until the next packet. The four continuous pilot sub-carriers may be used for frequency synchronisation. However in other types of OFDM communication system, such as digital audio or video broadcasting, other channel estimation techniques may be required. For example known pilot values for channel estimation may be inserted at intervals in both time (i.e. every few OFDM symbols) and frequency (i.e. on a subset of the subcarriers) and two-dimensional interpolation used to obtain channel estimates for the complete time and frequency space (i.e. for all the subcarriers and for successive OFDM symbols). Such interpolation techniques are well established in the art.

Until recently considerable effort was put into designing systems so as to mitigate for the perceived detrimental effects of multipath propagation, especially prevalent in indoor wireless LAN environments. However it has been recognised (see, for example, G.J. Foschini and M.J. Gans, "On limits of wireless communications in a fading environment when using multiple antennas" Wireless Personal

Communications vol. 6, no. 3, pp. 311-335, 1998) that by utilising multiple antenna architectures at both the transmitter and receiver, so-called multiple-input multiple-output (MIMO) architectures, much increased channel capacities are possible. Attention has also turned to the use of space-time coding techniques (a generalisation of trellis coded modulation, with redundancy in the space domain) in OFDM-based systems. This is described in Y Li, N. Seshadri & S. Ariyavisitakul, "Channel Estimation for OFDM Systems with Transmitter Diversity in Mobile Wireless Channels", IEEE JSAC, Vol. 17, No. 3, 1999.
Li et al. are particularly concerned with the estimation of channel state or parameter information (CSI), typically acquired via training sequences such as the Hiperlan/2 and IEEE802.11a.

Figure 7 shows a space-time coded MIMO-OFDM communications system 400 similar to that discussed by Li et al. A block of input data 402 b[n,k] at transmission time (or OFDM symbol or frame) n, k labelling elements of the block, is processed by a coding machine 404 which performs a space-time encoding operation. The input data may already been forward error corrected for example by a block encoder. The space-time (ST) encoder 404 provides a plurality of output signal blocks $t_i[n,k]$ (Li et al consider a two transmit antenna case, i=1,2) for driving a plurality

of IFFT (Inverse Fast Fourier Transform) blocks 406, which in turn drive corresponding rf stages 408 and transmit antennas 410. The IFFT blocks 406 are configured to add a cyclic prefix to the transmitted OFDM symbols, in the time domain. A plurality of pilot signals for channel estimation and frequency synchronisation and phase tracking is also inserted (not shown in Figure 7).

In the corresponding receiver a plurality of receive antennas 412 provide inputs to rf front ends 414, which in turn drive respective FFT (Fast Fourier Transform) blocks 416 each providing an input Rx[n,k], to a space-time decoder 418. Channel information is determined from the outputs of FFT blocks 416 and from estimates of $t_i[n,k]$ provided by ST encoder 421, by CSI (channel parameter estimator) block 420, and this information is provided to the decoder 418. Decoder 418 provides an output 422 comprising an estimate of the data sequence on input 402 of the transmitter.

The arrangement of Figure 7 effectively provides a set of parallel OFDM transmitters each transmitting a coded sequence of data derived from a codeword produced by the encoder 404. Broadly speaking the encoder 404 and IFFT blocks 406 of Figure 7 accept a string of length l of modulation symbols, as might be applied to a single OFDM transmitter, and produce a set of N_T of OFDM symbols, where N_T is the number of transmit

antennas, each of the same length l.

The skilled person will appreciate that although OFDM systems such as the transmitter and receiver of Figure 7 (and embodiments of the invention discussed later) are, for convenience, generally drawn in block diagram form in practice elements of these transmitters and receivers other than rf blocks 408 and 414 are likely to be implemented in software, for example on a digital signal processor, or may be specified in software by a design engineer using, for example, a hardware description language such as VHDL, the precise hardware implementation then being determined by the hardware description language compiler.

The example of Figure 9 is merely intended to provide some context helpful for understanding the later described invention, and it will be understood that the invention is not limited to an OFDM transmitter using any particular type of coding such as ST encoding. Thus embodiments of the invention, to be described later, may be employed with any MIMO-OFDM system and are not limited to space-time encoded MIMO-OFDM.

As previously mentioned, channel estimation in OFDM is usually performed by transmitting known symbols. Since OFDM can be viewed as a set of parallel flat channels the received signal on each subcarrier is divided by the transmitted pilot symbol to obtain the

channel. Broadly speaking, the actual value of the symbols (apart from its power) is irrelevant.

As will be described in more detail with reference to Figure 9 later, channel parameter estimation in an OFDM system may conveniently be performed by transforming received data to the time domain, windowing the data as necessary, and then, in effect, correlating it with training data. In a MIMO OFDM system with M transmitting antennas and a channel length of L there is a need to estimate LM parameters, but, there is also a need to avoid interference between training signals transmitted from different transmit antennas.

Techniques for channel estimation in multiple-antenna OFDM systems are described in Tai-Lai Tung, Kung Yao, R.E. Hudson, "Channel estimation and adaptive power allocation for performance and capacity improvement of multiple-antenna OFDM systems", SPAWC'01 (Taoyuan, Taiwan), pp 82-85, Mar 2001.

Consider a training sequence of length K (in Tung et al., equal to the number of subcarriers) and a channel with an impulse response length or "span" L sample periods T_S where (T_S is the sampling interval of the system and $1/T_S$ the entire channel bandwidth of the OFDM system). The channel span, in terms of time, is $(L-I)T_S$ and the OFDM frame length $T_S = (K + v)\ T_S$ where v is the number of cyclic prefix symbols. To avoid ISI

normally $v \geq L - 1$ although for the purpose of later described embodiments of the invention prior to channel estimation the length of a channel will not be known and L may therefore be assumed to be equal to the length of the cyclic prefix. In a receiver the channel is modelled as a FIR (Finite Impulse Response) filter with L taps and, again, a sampling interval T_S.

The time domain channel impulse response from a transmit antenna, say p, to a receive antenna, say q, of a MIMO system at OFDM symbol, may be denoted h [n], or more simply h, where $h = (h_0 \ldots\ldots h_{L-1})^T$, a vector of size $L \times 1$. The corresponding frequency response H (size $K \times 1$) is given by $H = F\,h$ where F is a $K \times L$ discrete Fourier transform (DFT) matrix of an L - point sequence producing a K - point DFT sequence. The received signal at a receive antenna is the sum of signals from each transmit antenna, each multiplied by the channel response from the respective transmit antenna to the receive antenna. The vector H lies in an L - dimensional subspace and by projecting into it the noise in the estimate of H, can be reduced by a factor of K/L (since white noise has equal power in all dimensions).

Tung et al. (ibid) derive the condition for a training sequence in a MIMO OFDM system to be usable to determine a channel estimate (for each transmit-receive antenna channel) with a substantially minimum MSE (mean

square error). It turns out that the condition is an orthogonality condition, that is that training sequences transmitted from the transmit antennas are substantially mutually orthogonal, as defined by Equation (1) below. This also ensures that interference between training sequences transmitted from different transmit antennas is mitigated.

$$F^{H}X(m)H_{X}(n)_{F} = \begin{cases} 0_{L} \\ cI_{L} \end{cases} \quad \text{Equation 1}$$

In Equation (1) 0_L is an all zero matrix of size $L \times L$, I_L is the identity matrix of size $L \times L$, c is an arbitrary scalar constant, and, m and n are both between 1 and M where M is the number of transmit antennas. The superscript ^{H} denotes a Hermitian conjugation operation. The matrix $X^{(m)}$ is a diagonal matrix (that is a matrix of zeros except for the diagonal elements), the diagonal elements comprising a training sequence for antenna m, that is $X^{(m)}$ = diag $\{X^m_1,\ldots X^m_k,\ldots X^m_k\}$ where X^m_k is the Kth element of a training sequence of length K (although in Tung et al. k more specifically indexes OFDM subcarriers). It will be recognised that Equation (1) is a condition that the training sequences from antennas m and n are orthogonal unless m = n (a condition on training sequences prior to Fourier transformation since subcarriers are in any case mutually orthogonal in an OFDM system). Details of one least square channel estimation method for a matrix channel of a MIMO system (i.e. for multiple

transmit antennas) are given in Tung et al. (see, for example, equation (7)) and hereby incorporated by reference.

Since there are LM parameters to estimate to determine a complete set of channel estimates for the matrix channel between each transmit and each receive antenna the training sequences must (each) be of length LM, that is $K \geq LM$. However the sequences which Tung et al. derive (equation (15)) require $K \geq 2^{M-1}L$ to achieve a minimum MSE for the channel estimates. Thus the required sequence length (or number of subcarriers where each subcarrier carries a training sequence element) grows exponentially with the number of transmitting antennas. This is a potentially severe drawback in MIMO OFDM systems with more then two transmit antennas, and four and eight transmit antennas are planned.

Disclosure of Invention

According to a first aspect of the present invention there is therefore provided an OFDM signal transmitted from an OFDM transmitter using a plurality of transmit antennas, the OFDM signal being adapted for channel estimation for channels associated with the transmit antennas by the inclusion of orthogonal training sequence data in the signal from each the antenna, the training sequence data being derived from substantially orthogonal training sequences of length K

for each the transmit antenna, the orthogonal training sequences being constructed such that a minimum required sequence length K needed to determine a channel estimate for at least one channel associated with each the transmit antenna is linearly dependent upon the number of the transmit antennas.

Examples of the orthogonal training sequences are described later together with techniques for constructing large numbers of such sequences. The sequences, being orthogonal, meet the criterion set out in Equation (1), which allows the training sequences to be capable of providing substantially minimum mean square error channel estimate for channels from each transmit antenna to one or more receive antennas of an OFDM receiver.

The skilled person will recognize that each training sequence is capable of providing at least one channel estimate, and possibly more than one channel estimate where more than one multipath component is associated with a channel.

The training sequences, which in practice will comprise digital data streams, need not be mathematically exactly orthogonal provided that they are substantially mutually orthogonal.

The training sequence data is based upon the training sequences but may, for example, be derived from scrambled versions of the sequences. The training

sequence data may be included in the OFDM signal as one or more OFDM symbols by performing an inverse Fourier transform (IFFT) on a training sequence and then adding a cyclic extension such as a cyclic prefix. Thus the training sequence data may be effectively incorporated in OFDM symbols transmitted from each of the transmit antennas.

Since the training sequences have lengths which grow linearly with the number of transmit antennas the training sequence overhead in MIMO OFDM communication systems may be significantly reduced, in effect allowing shorter training sequences or, equivalently, larger numbers of transmit antennas. In embodiments the sequence length is equal to the product of the number of transmit antennas and an approximate channel length or span, this being the minimum required sequence length.

The orthogonal training sequences may be constructed based upon sequences of values $X^m_k = \exp(j\ 2\pi\ k\ m\ L/K)$ where k indexes a value in the sequence, m indexes a transmit antenna and L is a positive integer. Index k may either run from 1 to K or from 0 to K-1, and similarly m may either run from 1 to M or from 0 to M-1. Integer L is preferable an estimate of the channel length and may be equal to the length of a cyclic extension such as a cyclic prefix of the OFDM signal. Preferably these sequences are scrambled to

provide a peak to average power ratio of substantially unity to reduce demands on the transmitter power amplifier. As will be described later there is potentially an infinite number of such scrambling sequences.

The training sequences upon which the training sequence data incorporated in the OFDM signal is based may have values distributed in time and/or frequency space. That is k may index subcarriers of the OFDM signal and/or OFDM symbols. Thus K may run over all the subcarriers of the OFDM signal so that an OFDM training symbol incorporates data for a complete sequence of values, for example each value in a training sequence being carried by one of the subcarriers of the training OFDM symbol. Alternatively training sequence values may be placed, for example, on alternate subcarriers or in some other pattern, or training sequence values may be spaced out in time over two or more OFDM training symbols. In a simplified case, however, K may be equated with the total number of subcarriers and data from one training sequence value placed on each subcarrier. Training sequence values, or scrambled training sequence values, or data derived from such sequences or scrambled sequences may be stored in a look-up table to avoid the need for the values or data to be calculated in real time.

In a related aspect the invention also provides an

OFDM signal including training sequence data for channel estimation for a plurality of transmit antennas, the training sequence data being based upon training sequences of length K defined by values of exp (j 2π k m L/K) where k indexes a value in the sequence, m indexes a transmit antenna and L is a positive integer.

The invention further provides an OFDM transmitter configured to transmit the above-described OFDM signal, and a data carrier (such as mentioned below) carrying the above-described training sequence data.

The invention also provides an OFDM transmitter having a plurality of transmit antennas, the OFDM transmitter being configured to transmit, from each the transmit antenna, training sequence data based upon a training sequence, the training sequences upon which the training sequence data for the antennas is based being constructed such that:

i) the training sequences are substantially mutually orthogonal;

ii) the training sequences allow a receiver to determine a channel estimate for a channel associated with each the transmit antenna; and

iii) a minimum length of each the training sequence needed to satisfy (ii) is substantially linearly dependent upon the number of transmit antennas.

Preferably the OFDM transmitter is configured to transmit, from each of the transmit antennas, training sequence data based upon a training sequence having values $X^m_k = \exp(j\ 2\pi\ k\ m\ L/K)$ where k indexes a value in a sequence of length K, m indexes the transmit antenna, and L is a positive integer. The channel estimate may be a least squares estimate.

Likewise the invention provides an OFDM transmitter having a plurality of transmit antennas, the OFDM transmitter being configured to transmit, from each the transmit antenna, training sequence data based upon a training sequence having values

$$X^m_k = \exp(j\ 2\pi\ k\ m\ L/K)$$

where k indexes a value in a sequence of length K, m indexes the transmit antenna, and L is a positive integer.

The invention also provides an OFDM transmitter configured to transmit an OFDM signal from a plurality of transmit antennas, the OFDM transmitter comprising a data memory storing training sequence data for each of the plurality of antennas; an instruction memory storing processor implementable instructions; and a processor coupled to the data memory and to the instruction memory to read and process the training sequence data in accordance with the instructions, the instructions comprising instructions for controlling the processor to read the training sequence data for

each antenna; inverse Fourier transform the training sequence data for each antenna; provide a cyclic extension for the Fourier transformed data to generate output data for each antenna; and provide the output data to at least one digital-to-analogue converter for transmission; and wherein the training sequence data for the antenna comprises data derived from a sequence of values

$$X^{m}_{k} = \exp (j\ 2\pi\ k\ m\ L/K)$$

where m indexes the antenna, k indexes values in the sequence, L is a positive integer, and wherein the sequence has a length K.

In a related aspect the invention provides a method of providing an OFDM signal from an OFDM transmitter having a plurality of transmit antennas with training sequence data for determining a channel estimate for each of the transmit antennas, the method comprising inserting training sequence data for each the transmit antenna into the OFDM signal, the training sequence data being derived from orthogonal training sequences of length K for each the antenna, the orthogonal training sequences being constructed such that a minimum required sequence length K needed to determine a channel estimate for at least one channel associated with each the transmit antenna is linearly dependent upon the number of the transmit antennas.

The above-described training sequence data and/or

processor control code to implement the above-described OFDM transmitters and methods may be provided on a data carrier such as a disk, CD- or DVD-ROM, programmed memory such as read-only memory (Firmware), or on a data carrier such as optical or electrical signal carrier. For many applications embodiments of the above-described transmitters, and transmitters configured to function according to the above-described methods will be implemented on a DSP (Digital Signal Processor), ASIC (Application Specific Integrated Circuit) or FPGA (Field Programmable Gate Array). Thus code (and data) to implement embodiments of the invention may comprise conventional program code, or microcode or, for example, code for setting up or controlling an ASIC or FPGA. Similarly the code may comprise code for a hardware description language such as Verilog (Trade Mark) or VHDL (Very high speed integrated circuit Hardware Description Language). As the skilled person will appreciate such code and/or data may be distributed between a plurality of coupled components in communication with one another.

These and other aspects of the invention will now be further described, by way of example only, with reference to the accompanying Figures in which:

Brief Description of Drawings

Figures 1 and 2 show, respectively, subcarriers of an OFDM signal spectrum, and a conventional OFDM

transmitter and receiver;

Figures 3 to 5 show, respectively, an OFDM receiver front end, an OFDM receiver signal processor, and a conceptual illustration of a channel estimation procedure;

Figure 6 shows a time and frequency domain plot of a Hiperlan 2 OFDM signal showing preamble and pilot signal positions;

Figure 7 shows a known space-time coded MIMO OFDM communications system;

Figure 8 shows a MIMO OFDM communications system embodying aspects of the present invention;

Figure 9 shows a block diagram of a channel parameter estimator for a MIMO OFDM receiver;

Figure 10 shows a block diagram of a MIMO OFDM transmitter according to an embodiment of the present invention;

Figure 11 shows a graph of mean square error against signal-to-noise ratio comparing the performance of embodiments of the present invention with prior art techniques for different numbers of transmitter antennas;

Figure 12 shows a graph of mean square error against signal-to-noise ratio comparing embodiments of the present invention against prior art techniques for different numbers of transmitter antennas using a longer training sequence than used for Figure 11; and

Figure 13 shows a graph of mean square error against signal-to-noise ratio comparing the performance of embodiments of the invention with prior art techniques for different training sequence lengths.

Best Mode for Carrying Out the Invention

Referring again to Equation 1 above, it has been recognised that this equation can be satisfied by training sequences given by Equation 2 below:

$$X_{k,k}^{(m)} = \exp(j2\pi kmL / K), 0 \le k \le K-1, 0 \le m \le M-1$$

Equation 2

In Equation 2 m and k run from 0 to M-1 and from 0 to K-1 respectively or, equivalently, from 1 to M and from 1 to K respectively. Index m labels a transmit antenna and values in a training sequence to be transmitted from that antenna are labelled by index k so that a training sequence transmitted by a transmit antenna has a length K. The index k can label subcarriers so that, for example, each value X_k is transmitted on a different subcarrier (in which case K is preferably the total number of subcarriers) or the training sequence values may be distributed in some other way, for example, k labelling alternate subcarriers and the training sequence X_k being distributed over two OFDM symbols, half in one symbol and half in the next. The skilled person will recognise that numerous variations are possible along these lines. It will further be recognised that in

effect the length of the training sequence is defined by K.

Where one training sequence value X_k is allocated to each subcarrier an OFDM training symbol for transmission by an antenna of an OFDM transmitter may be constructed by performing an inverse Fourier transform of the K samples or values of a training sequence and then adding a cyclic prefix (conversion to an analogue waveform by a digital-to-analogue converter is understood). The skilled person will recognise that the training sequences may be oversampled, for example by altering the inverse Fourier transform matrix from a $K \times K$ matrix to a $K \times 2K$ matrix to provide an output data sequence of length of 2K.

In Equation 2 L is a positive integer selected to approximate the channel length in sample periods. However since the length of a channel will not generally be known prior to its estimation L may be taken to be equal to or greater than the cyclic prefix length since the cyclic prefix is normally selected to be longer than the channel.

The training sequences defined by Equation 2 are orthogonal and satisfy an optimality criterion (i.e. minimum MSE) provided that $K \geq ML$. Thus the required sequence length only grows linearly with the number of transmit antennas and hence overcomes the potentially severe limitations of prior techniques when used with

more than two transmit antennas. Although the criterion of Equation 1 is known from Tung et al. it has not previously been recognised that training sequences derived from the sequences defined by Equation 2 meet this criterion.

One potential difficulty in using the sequences defined by Equation 2 is that an inverse Fourier transform of a sequence of K values defined by Equation 2 comprises a series of impulse functions in the time domain. This spiky signal requires a large dynamic range for the digital-to-analogue converter (DAC) and has an undesirable peak-to-average power ratio (PAPR). Broadly speaking the lower the PAPR the less stringent the requirements on the DAC and the more efficient the OFDM transmitter. The difficulty can be addressed by scrambling the training sequence in the frequency domain, that is prior to applying an inverse Fourier transform.

The scrambling operation is defined by Equation 3, where the scrambling sequence is $c_k, |c_k| = 1, \forall k$ in which k indexes values in the scrambling sequence.

$$\tilde{X}_{k,k}^{(m)} = c_k X_{k,k}^{(m)} \qquad \text{Equation 3}$$

There is potentially an infinite number of scrambling sequences with modulus values of one for all k (and all $c_k = 1$ reproduces the original sequence). By choosing a scrambling code sequence appropriately the peak-to-average power ratio can be kept low, which

reduces non-linear effects in the communication system and hence improves channel estimation.

Suitable scrambling sequences are described in Leopold Bomer and Markus Antweiler, "Perfect N-phase sequences and arrays", IEEE JSAC, vol 10, no 4, pp 782-789, May 1992, which paper is hereby incorporated by reference. Bomer and Antweiler describe so-called "perfect" sequences and arrays, which have a periodic auto-correlation function and whose out-of-phase values are zero. Time discrete N-phase sequences and arrays have complex elements of magnitude 1 and one of $(2\pi/N)n$, $0 \leq n < N$, different phase values. Bomer and Antweiler describe construction methods for some perfect N-phase sequences and arrays and, for example, the Chu sequences described in their paper can be used to achieve a peak-to-average power ratio of substantially unity.

The construction of Chu sequences of size S_X is described in D.C. Chu, "Polyphase codes with good periodic correlation properties", IEEE Trans. Inform. Theory, vol. IT-25, pp. 720-724, 1979. Chu sequences are constructed using:

$s(x) = \exp\{j(2\pi/N)n \cdot x^2\}$ for S_X even

$s(x) = \exp\{j(2\pi/N)n \cdot x(x+1)\}$ for S_X odd

$0 \leq x \leq S_X - 1$

where n is coprime with S_X. The alphabet N of the Chu sequences is given by:

$N = 2S_X$ for S_X even

$N = S_x$ for S_x odd

With variation of n, this construction generates $\Phi(S_x)$ different perfect N-phase sequences, where $\Phi(\cdot)$ denotes Eulier's totient function.

The construction and use of training sequences derived from Equation 2 will now be illustrated with a simple example.

Consider, for the sake of illustration, a small OFDM system with M=2 transmit antennas, K=4 subcarriers and a channel length of L=2. Then $X_{k,k}^{(m)} = \exp(j2\pi kmL / K) = \exp(j2\pi km / 2) = (-1)^{km}$ is equal to $X_{k,k}^{(0)} = \{1,1,1,1\}$ and $X_{k,k}^{(1)} = \{1,-1,1,-1\}$. The 4 × 2 FFT matrix is

$F_{kl} = \frac{1}{\sqrt{K}} \exp(-j2\pi kl / K) = \frac{1}{\sqrt{4}} \exp(-j2\pi kl / 4) = \frac{1}{2}(-j)^{kl}$ and hence $F = \frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j \\ 1-1 \\ 1 & j \end{pmatrix}$. We It can be seen that the sequences are orthogonal; by applying Equation (1):

$$F^H X^{(0)H} X^{(0)} F = \frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j \\ 1-1 \\ 1 & j \end{pmatrix}^H \begin{pmatrix} 1&0&0&0 \\ 0&1&0&0 \\ 0&0&1&0 \\ 0&0&0&1 \end{pmatrix}\begin{pmatrix} 1&0&0&0 \\ 0&1&0&0 \\ 0&0&1&0 \\ 0&0&0&1 \end{pmatrix}\frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j \\ 1-1 \\ 1 & j \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix},$$

$$F^H X^{(0)H} X^{(1)} F = \frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j \\ 1-1 \\ 1 & j \end{pmatrix}^H \begin{pmatrix} 1&0&0&0 \\ 0&1&0&0 \\ 0&0&1&0 \\ 0&0&0&1 \end{pmatrix}\begin{pmatrix} 1&0&0&0 \\ 0&-1&0&0 \\ 0&0&1&0 \\ 0&0&0&-1 \end{pmatrix}\frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j \\ 1-1 \\ 1 & j \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix},$$

$$F^H X^{(1)H} X^{(0)} F = \frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j \\ 1-1 \\ 1 & j \end{pmatrix}^H \begin{pmatrix} 1&0&0&0 \\ 0&-1&0&0 \\ 0&0&1&0 \\ 0&0&0&-1 \end{pmatrix}\begin{pmatrix} 1&0&0&0 \\ 0&1&0&0 \\ 0&0&1&0 \\ 0&0&0&1 \end{pmatrix}\frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j \\ 1-1 \\ 1 & j \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix},$$

$$F^H X^{(1)H} X^{(1)} F = \frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j \\ 1-1 \\ 1 & j \end{pmatrix}^H \begin{pmatrix} 1&0&0&0 \\ 0&-1&0&0 \\ 0&0&1&0 \\ 0&0&0&-1 \end{pmatrix}\begin{pmatrix} 1&0&0&0 \\ 0&-1&0&0 \\ 0&0&1&0 \\ 0&0&0&-1 \end{pmatrix}\frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j \\ 1-1 \\ 1 & j \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}.$$

The training sequences in frequency space are $P_k^{(m)} = X_{k,k}^{(m)}$, so the transmitted signals (that is, after IFFT) are $p_k^{(m)} = \sum_{l=0}^{K-1} P_l^{(m)} \frac{1}{\sqrt{K}} \exp(j2\pi kl / K)$, giving, $p_k^{(0)} = \{2,0,0,0\}$ and $p_k^{(1)} = \{0,0,2,0\}$. As these have a poor peak-to-average power ratio (this is 4), the sequences are preferably scrambled. Using the Chu sequence $c_k = \exp(j2\pi k^2 3 / 8) = \left\{1, \frac{-1+j}{\sqrt{2}}, -1, \frac{-1+j}{\sqrt{2}}\right\}$, one can create new training sequences $\tilde{X}_{k,k}^{(m)} = c_k X_{k,k}^{(m)}$, that is, $\tilde{X}_{k,k}^{(0)} = \left\{1, \frac{-1+j}{\sqrt{2}}, -1, \frac{-1+j}{\sqrt{2}}\right\}$ and $\tilde{X}_{k,k}^{(1)} = \left\{1, \frac{1-j}{\sqrt{2}}, -1, \frac{1-j}{\sqrt{2}}\right\}$.

Again one can verify that these are orthogonal using Equation (1):

$$ {}_F H_{X(0)} H_{X(0)F} = \frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j & \\ 1 & -1 \\ 1 & j \end{pmatrix}^H \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \frac{-1-j}{\sqrt{2}} & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & \frac{-1-j}{\sqrt{2}} \end{pmatrix} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \frac{-1+j}{\sqrt{2}} & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & \frac{-1+j}{\sqrt{2}} \end{pmatrix} \frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j & \\ 1 & -1 \\ 1 & j \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}, $$

$$ {}_F H_{X(0)} H_{X(1)F} = \frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j & \\ 1 & -1 \\ 1 & j \end{pmatrix}^H \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \frac{-1-j}{\sqrt{2}} & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & \frac{-1-j}{\sqrt{2}} \end{pmatrix} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \frac{1-j}{\sqrt{2}} & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & \frac{1-j}{\sqrt{2}} \end{pmatrix} \frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j & \\ 1 & -1 \\ 1 & j \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}, $$

$$ {}_F H_{X(1)} H_{X(0)F} = \frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j & \\ 1 & -1 \\ 1 & j \end{pmatrix}^H \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \frac{1+j}{\sqrt{2}} & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & \frac{1+j}{\sqrt{2}} \end{pmatrix} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \frac{-1+j}{\sqrt{2}} & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & \frac{-1+j}{\sqrt{2}} \end{pmatrix} \frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j & \\ 1 & -1 \\ 1 & j \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}, $$

$$ {}_F H_{X(1)} H_{X(1)F} = \frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j & \\ 1 & -1 \\ 1 & j \end{pmatrix}^H \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \frac{1+j}{\sqrt{2}} & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & \frac{1+j}{\sqrt{2}} \end{pmatrix} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \frac{1-j}{\sqrt{2}} & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & \frac{1-j}{\sqrt{2}} \end{pmatrix} \frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1-j & \\ 1 & -1 \\ 1 & j \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}. $$

The (scrambled) training sequences in frequency space are $\tilde{P}_k^{(m)} = \tilde{X}_{k,k}^{(m)}$, so the transmitted signals (after

IFFT) are $\tilde{p}_k^{(m)} = \sum_{l=0}^{K-1} \tilde{P}_l^{(m)} \frac{1}{\sqrt{K}} \exp(j2\pi kl / K)$, now giving, $\tilde{p}_k^{(0)} = \left\{\frac{-1+j}{\sqrt{2}}, 1, \frac{1-j}{\sqrt{2}}, 1\right\}$ and $\tilde{p}_k^{(1)} = \left\{\frac{1-j}{\sqrt{2}}, 1, \frac{-1+j}{\sqrt{2}}, 1\right\}$. It can be seen that these scrambled sequences now have a peak-to-average power ratio of 1.

Referring now to Figure 8, this shows an OFDM communications system 500 suitable for use with the above described training sequences. Thus a user data stream 502 is input to a conventional MIMO transmitter processor 504 which provides a plurality of outputs to IFFT blocks 510 each driving a respective one of a set of transmit antennas 512 to transmit a set of OFDM symbols. A MIMO training sequence is provided by block 506, either being constructed as required or being stored, for example in a look-up table. The MIMO training sequence is provided to a scrambling block 508 which applies a scrambling sequence according to Equation 3, and the scrambled training sequence is then inserted in the data stream to be transmitted as OFDM symbols by MIMO processor 504. In practice training sequence and scrambling blocks 506, 508 may comprise temporary or permanent data storage such as Flash RAM or EPROM. Although two separate blocks are shown for clarity, in practice a scrambled training sequence is likely to be precalculated and stored in a local storage medium.

Continuing to refer to Figure 8, each of a

plurality of receive antennas 514 receives signals from each of the transmit antennas 512, the received signals being passed to FFT blocks 516 and thence to a conventional MIMO OFDM receiver processor 518, which provides an output data stream 522. Processor 518 also receives a set of MIMO channel estimation values from MIMO channel estimation block 520. Any conventional least square (LS) algorithm may be employed for MIMO channel estimation and embodiments of the invention using the above-described training sequences do not require any modification to a conventional MIMO OFDM receiver (although, as usual, the receiver needs to know the training sequence(s) used). Thus a standard adaptive filter based channel estimation technique may be employed to estimate one or more channels (depending upon the number of receive antennas) for each transmit antenna.

Li et al. (ibid) describe one example of a least square channel estimation technique (employing windowing in the time domain), and an outline of this technique is illustrated in Figure 9. For further details of the algorithm reference may be made to the Li et al. paper (hereby incorporated by reference).

In more detail, Figure 9 illustrates a channel parameter estimator 600 having received signal and training data inputs similar to those described above with reference to Figure 7. Thus in Figure 9 the

following nomenclature is employed:

- $Rx[n,k]$ – Received signal;
- $t[n,k]$ – Training sequence;
- $\overline{P}[n]$ – Matrix of correlation between received signal and training sequence;
- $\overline{Q}[n]$ – Matrix of correlation between training sequences;
- $\overline{h}[n, L]$ – Matrix of estimated channel in time domain;
- $\overline{H}[n, K]$ – Matrix of estimated channel in frequency domain;

In Figure 9 i labels a transmit antenna and thus multiplier 602 forms a product of the received signal with each (scrambled) training sequence. The result of this operation, performed for the (conjugate of the) training sequence of each transmit antenna, is passed to an IFFT block 606 which provides a time domain data output for each of these training sequences (associated with each transmit antenna) comprising a correlation matrix between the received signal and a respective training sequence. Notionally a set of multipliers 604 (of which only one is shown for clarity) forms a set of products of training sequences transmitted by different transmit antennas and, again, these are translated to the time domain by an IFFT block 608 to provide a set of output matrices Q_{ij}. In practice Q_{ij} (or more usefully $\overline{Q}^{-1}[n]$, to avoid a matrix inversion) can be pre-calculated since the transmitted data for the

training block is known.

Outputs from IFFT blocks 606, 608 are provided to a MIMO channel estimation block 610, which operates according to a least squares (LS) algorithm to calculate

$$\bar{h}[n, L] = \bar{Q}^{-1}[n]\,\bar{P}[n]$$

Thus the outputs from channel estimation block 610 comprise a set of (time domain) channel estimates, for each receive antenna one for each of the transmit antennas, and these are provided to sets of FFT blocks 612, 614, of which only two are shown in Figure 9 for clarity. These FFT blocks transform the time domain channel estimates to frequency domain estimates, again one set of estimates (for the set of transmit antennas) for each receive antenna.

As previously explained, to minimise the MSE, the correlation matrix $\bar{Q}[n]$ should be the identity matrix, and this is achieved with the training sequences derived using Equation 2. Thus embodiments of the invention do not require any modification to a conventional receiver.

Figure 10 shows an example of an OFDM transmitter 700 configured to use training sequences according to embodiments of the present invention. Broadly speaking the majority of the signal processing is performed in the digital domain, conversion to analogue signals only taking place for the final RF stages.

In Figure 10 two transmit antennas 702a,b are driven by respective RF stages 704a,b, typically comprising an up-converter, power amplifier and, optionally, windowing filters. The RF stages are driven by I and Q outputs of respective digital-to-analogue converters 706a,b which receive inputs from a digital signal processor (DSP) 708. Digital data for transmission is provided on an input 710 to DSP 708.

DSP 708 will generally include one or more processors 708a and working memory 708b, and has a data, address and control bus 712 to couple the DSP to permanent program and data memory 714, such as Flash RAM or ROM. Memory 714 stores processor control code for controlling DSP 708 to provide OFDM functions, in particular IFFT code 714a, cyclic prefix addition code 714b, training sequence insertion code 714c, and block error (such as Reed-Solomon) correction and ST encoding code 714d. Memory 714 also stores training sequence data, here with sequence insertion code 714c, for inclusion in OFDM symbols transmitted from antennas 702a,b for channel estimation by a complementary OFDM receiver. As illustrated, some or all of the data and/or code stored in memory 714 may be provided on a removable storage medium 716 or on some similar data carrier. Although only two transmit antennas are shown in Figure 10 the skilled person will recognise that in practice more transmit antennas, such as 4, 6 or 8

antennas may be employed.

Figures 8, 9 and 10 show graphs illustrating comparisons of the performance of the above-described training sequences with conventional training sequences for least squares algorithms, in particular those described in Tung et al. and Li et al (ibid).

Figure 11 shows a graph of mean square error (MSE) on the y-axis against received signal-to-noise ratio (S/N) in dB for systems with two and three transmit antennas. In the graph of Figure 11 an FFT size of 52 is assumed, corresponding to existing global WLAN OFDM systems such as Hiperlan/2 (in Europe), IEEE 802.11a (in the USA), and HiSWAN (in Japan). In these standards the FFT size is 64 but only 52 subcarriers are available for data transmission (including user data and pilot sequences) and therefore, for a fair comparison, an FFT size of 52 has been assumed in Figure 11. The multipath channel is assumed to have the same span as the defined period of cyclic prefix (CP), that is 15 sampling periods, to avoid inter-symbol interference (ISI).

In Figure 11 curves 802, 804, 806 and 808 correspond to, respectively, the application of a MIMO technique with a conventional training sequence for an LS algorithm according to Tung and Li with two transmit antennas; a training sequence according to Equation 2 above without scrambling, with both two and three

transmit antennas; a training sequence according to Equation 2 above with a random scrambling process with both two or three transmit antennas; and a training sequence according to Equation 2 above with a so-called "perfect" scrambling sequence according to Bomer and Antweiler (ibid) for both two and three transmit antennas. Curve 800 shows the performance of a conventional training sequence in an MIMO system according to Tung and Li with three transmit antennas. Curves 802, 804, 806 and 808 substantially correspond but curve 800 shows a significant residual mean square error, illustrating that conventional techniques (as described in Tung and Li) are only able to support two transmit antennas whereas the above-described techniques can support, in this case, three transmit antennas.

Figure 12 shows a second graph of mean square error on the y-axis against signal-to-noise ratio (in dB) on the x-axis, in this case for a fixed length of training sequence (K = 128) and for 4, 5 and 8 transmit antennas. Curves 904, 902 and 900 show, respectively, the performance for a conventional scheme with 4, 5 and 8 transmit antennas whereas curve 906 shows the performance of a training sequence according to Equation 2 above (either with or without scrambling) also for 4, 5 and 8 transmit antennas. It can be seen that the conventional scheme can only support up to

four transmit antennas ($2^{4-1}*16$) whereas the proposed scheme can support up to 8 transmit antennas (8*16).

Figure 13 shows the effect of varying the training sequence length, again with mean square error on the y-axis and signal-to-noise ratio (in dB) from the x-axis. The curve of Figure 13 relates to a system with eight transmit antennas and an assumed channel length of 16. Curves 1000, 1002, 1004, 1006 and 1008 relate to training schemes according to the prior art with sequence lengths of, respectively, 128, 256, 512, 1024, and 2048. Curves 1010, 1012, 1014, 1016, and 1018 relate to training sequences derived on the basis of Equation 2 above with respective training sequence length of 128, 256, 512, 1024, and 2048. It can be seen that in order to achieve a reasonable performance (say a mean square error of better than around 10^{-3} at 10 dB S/N) a training sequence of only 128 is required whereas a conventional scheme needs a training sequence length of 1024 or 2048, which presents a significant disadvantage.

The above-described technology is useful for OFDM communications systems with multiple transmit antennas such as MIMO systems. The technology is applicable to both terminals and base stations or access points and is not limited to any of the existing standards employing OFDM communication. With conventional techniques for use with least square channel estimation

(which is simple and provides good performance) the required training sequence length is $K \geq 2^{M-1}L$ and grows exponentially with the number of antennas whereas with the above described techniques the required sequence length is $K \geq ML$ and is linearly proportional to the number of transmit antennas. The above described techniques can also provide a peak-to-average power ratio of close to unity, which enables the use of OFDM transmitter power amplifiers with a reduced specification.

No doubt many other effective alternatives will occur to the skilled person. It will be understood that the invention is not limited to the described embodiments and encompasses modifications apparent to those skilled in the art lying within the spirit and scope of the claims appended hereto.

C L A I M S

1. An OFDM signal transmitted from an OFDM transmitter using a plurality of transmit antennas, the OFDM signal being adapted for channel estimation for channels associated with said transmit antennas by the inclusion of orthogonal training sequence data in the signal from each said antenna, said training sequence data being derived from substantially orthogonal training sequences of length K for each said transmit antenna, said orthogonal training sequences being constructed such that a minimum required sequence length K needed to determine a channel estimate for at least one channel associated with each said transmit antenna is linearly dependent upon the number of said transmit antennas.

2. An OFDM signal as claimed in claim 1, wherein said orthogonal training sequences are constructed based upon sequences of values

$$X^m_k = \exp(j\, 2\pi\, k\, m\, L/K)$$

where k indexes a value in a said sequence, m indexes a transmit antenna, L is a positive integer, and K is the length of a said sequence.

3. An OFDM signal as claimed in claim 2, wherein said orthogonal training sequences are based upon scrambled versions of said sequences of values X^m_k.

4. An OFDM signal as claimed in claim 3, wherein portions of said OFDM signal including said training

sequence data have a peak-to-average power ratio of substantially unity.

5. An OFDM signal as claimed in claim 2, 3 or 4, wherein said index k indexes subcarriers of said OFDM signal.

6. An OFDM signal as claimed in claim 2, 3, 4 or 5, wherein said index k indexes OFDM symbols of said OFDM subcarrier.

7. An OFDM signal as claimed in any one of claims 2 to 6, wherein L is equal to the length of a cyclic extension of said OFDM signal in sample periods.

8. An OFDM signal including training sequence data for channel estimation for a plurality of transmit antennas, said training sequence data being based upon training sequences of length K defined by values of exp (j 2π k m L/K) where k indexes a value in a said sequence, m indexes a transmit antenna and L is a positive integer.

9. An OFDM transmitter configured to transmit the OFDM signal of any one of claims 1 to 8.

10. An OFDM data transmission system comprising the transmitter of claim 9 and an OFDM receiver configured to receive the OFDM signal.

11. A data carrier carrying training sequence data as defined in any one of claims 1 to 8 for a set of said transmit antennas.

12. An OFDM transmitter having a plurality of

transmit antennas, said OFDM transmitter being configured to transmit, from each said transmit antenna, training sequence data based upon a training sequence, said training sequences upon which said training sequence data for said antennas is based being constructed such that:

i) said training sequences are substantially mutually orthogonal;

ii) said training sequences allow a receiver to determine a channel estimate for a channel associated with each said transmit antenna; and

iii) a minimum length of each said training sequence needed to satisfy (ii) is substantially linearly dependent upon the number of transmit antennas.

13. An OFDM transmitter having a plurality of transmit antennas, said OFDM transmitter being configured to transmit, from each said transmit antenna, training sequence data based upon a training sequence having values

$$X^{m}_{k} = \exp(j\ 2\pi\ k\ m\ L/K)$$

where k indexes a value in a sequence of length K, m indexes a said transmit antenna, and L is a positive integer.

14. An OFDM transmitter as claimed in claim 12 or 13, wherein said training sequence data is based upon scrambled versions of said training sequences.

15. An OFDM transmitter as claimed in claim 14, wherein said scrambled versions of said training sequences are selected to provide a peak-to-average ratio of transmitted power of approximately one.

16. An OFDM transmitter as claimed in claims 12, 13, 14 or 15 configured to transmit an OFDM signal with K subcarriers.

17. Processor control code and training sequence data to, when running, implement the OFDM transmitter of any one of claims 9 and 12 to 16.

18. A carrier carrying the processor control code and data of claim 17.

19. An OFDM transmitter configured to transmit an OFDM signal from a plurality of transmit antennas, the OFDM transmitter comprising:

a data memory storing training sequence data for each of said plurality of antennas;

an instruction memory storing processor implementable instructions; and

a processor coupled to said data memory and to said instruction memory to read and process said training sequence data in accordance with said instructions, said instructions comprising instructions for controlling the processor to:

read said training sequence data for each antenna;

inverse Fourier transform said training sequence data for each antenna;

provide a cyclic extension for said Fourier transformed data to generate output data for each antenna; and

provide said output data to at least one digital-to-analogue converter for transmission; and

wherein said training sequence data for a said antenna comprises data derived from a sequence of values

$X^m_k = \exp(j\, 2\pi\, k\, m\, L/K)$

where m indexes the said antenna, k indexes values in the sequence, L is a positive integer, and wherein the sequence has a length K.

20. An OFDM transmitter as claimed in claim 19, wherein said training sequence data is based upon a scrambled sequence of values $c_k X^m_k$ where c_k denotes a value in a scramble sequence indexed by k.

21. A data carrier carrying the training sequence data for each antenna of claim 19 or 20.

22. A data carrier as claimed in claim 21, further comprising said processor implementable instructions.

23. A method of providing an OFDM signal from an OFDM transmitter having a plurality of transmit antennas with training sequence data for determining a channel estimate for each of said transmit antennas, the method comprising:

inserting training sequence data for each said transmit antenna into said OFDM signal, said training

sequence data being derived from orthogonal training sequences of length K for each said antenna, said orthogonal training sequences being constructed such that a minimum required sequence length K needed to determine a channel estimate for at least one channel associated with each said transmit antenna is linearly dependent upon the number of said transmit antennas.

24. A method as claimed in claim 23, further comprising retrieving said training sequence data from a training sequence data store.

25. A method as claimed in claim 23 or 24, wherein said orthogonal training sequences are based upon sequences of values of length K

$$X^m_k = \exp(j\ 2\pi\ k\ m\ L/K)$$

where k indexes a value in a said sequence, m indexes a transmit antenna and L is a positive integer.

26. A method as claim in claim 25, wherein said orthogonal training sequences are based upon scrambled versions of said sequences of values X^m_k.

27. A method as claimed in claim 26, wherein portions of said OFDM signal including said training sequence data have a peak-to-average power ratio of substantially unity.

28. A data carrier carrying training sequence data for each said transmit antenna as recited in any one of claims 23 to 27.

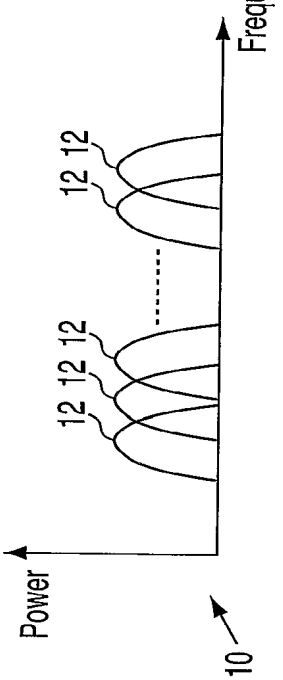


FIG. 1 (PRIOR ART)

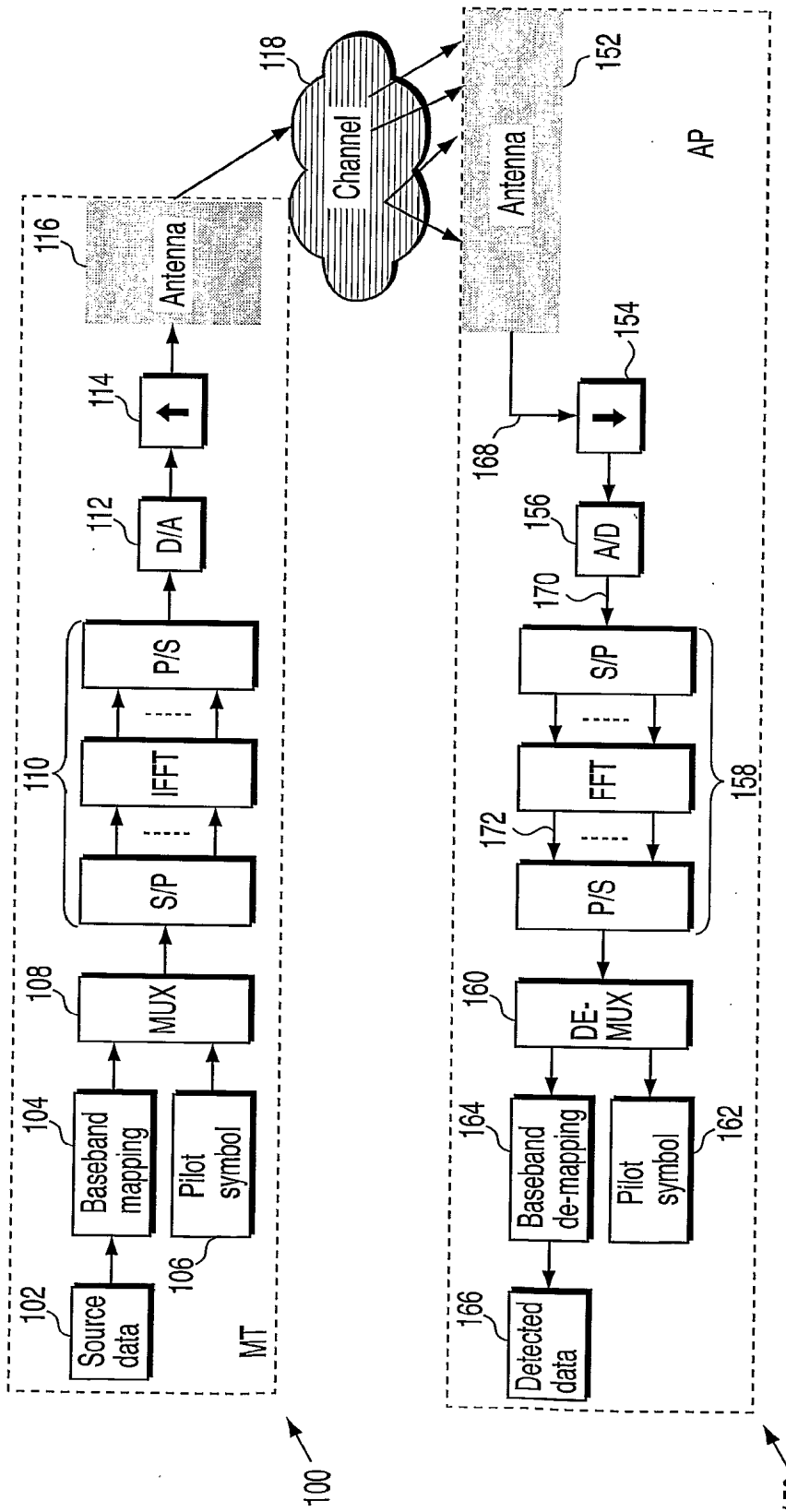


FIG. 2 (PRIOR ART)

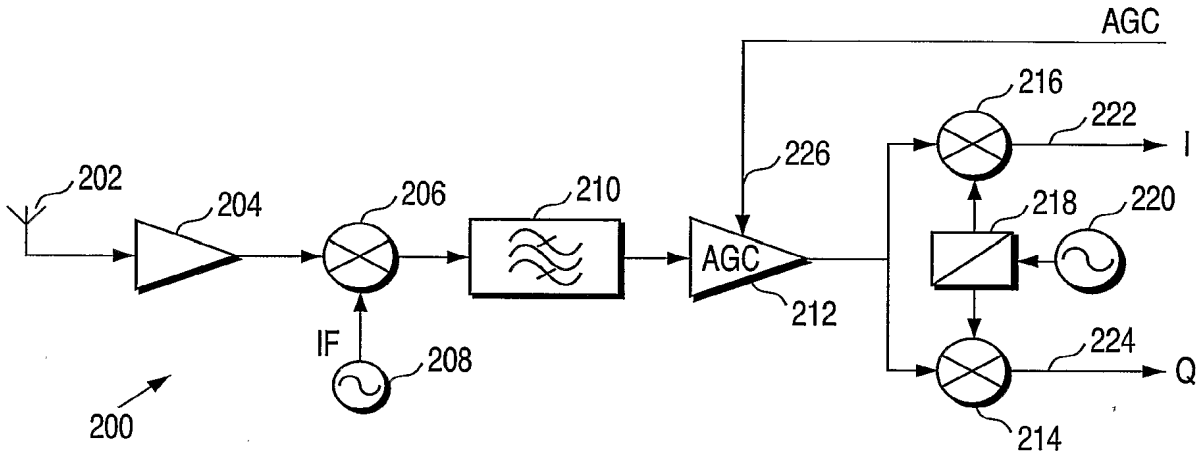


FIG. 3 (PRIOR ART)

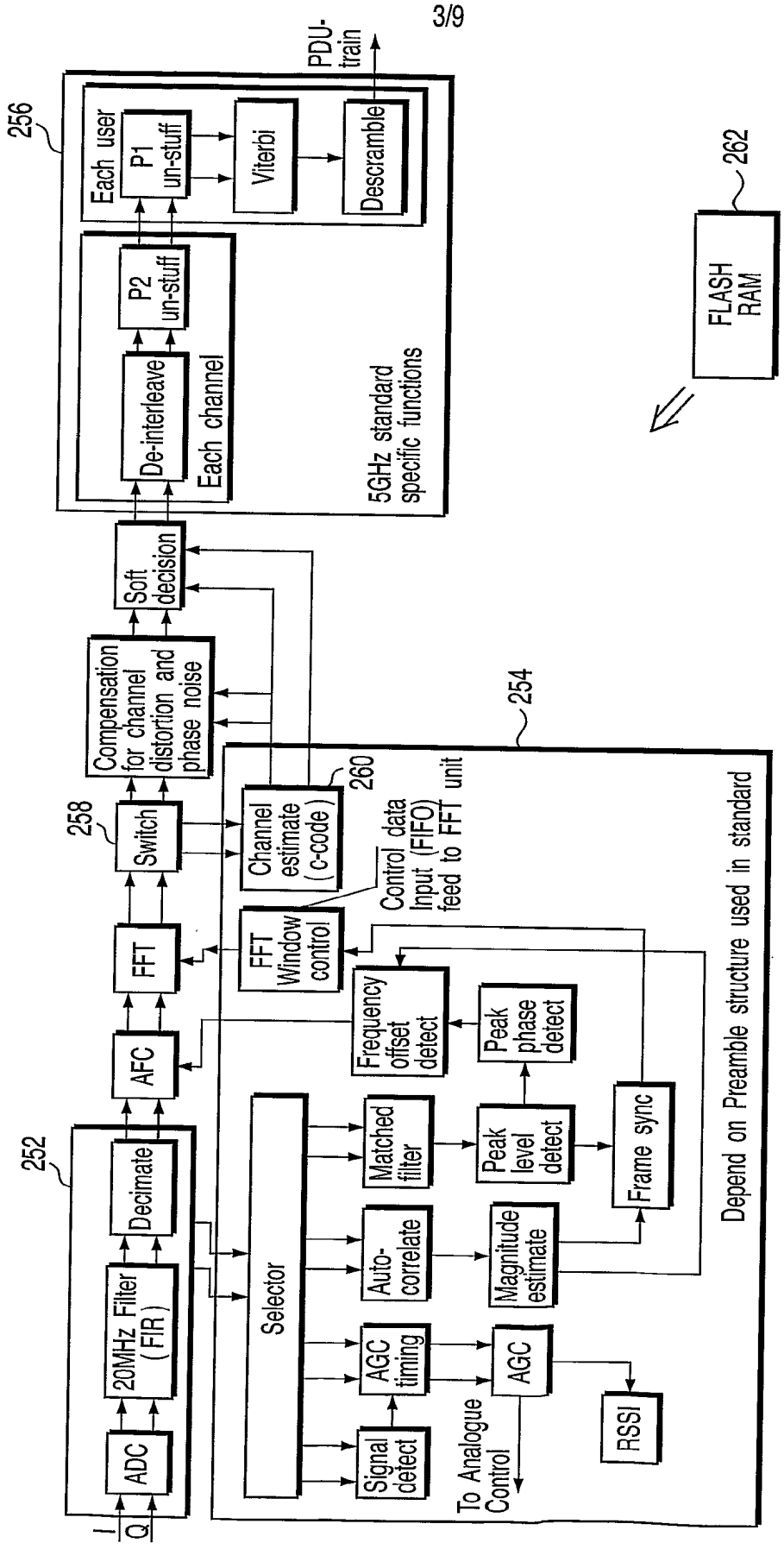


FIG. 4 (PRIOR ART)

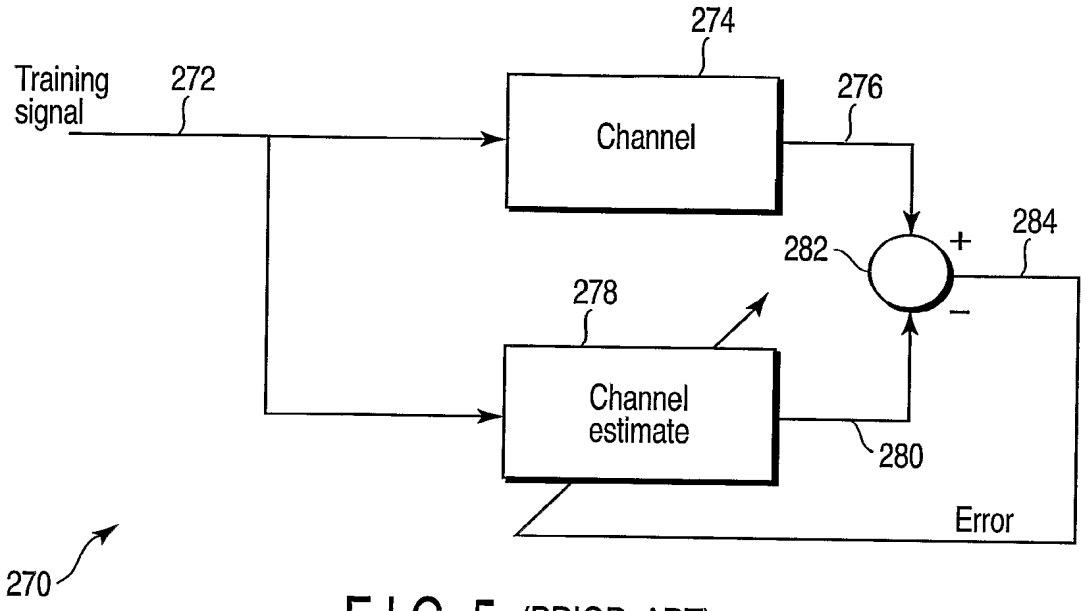


FIG. 5 (PRIOR ART)

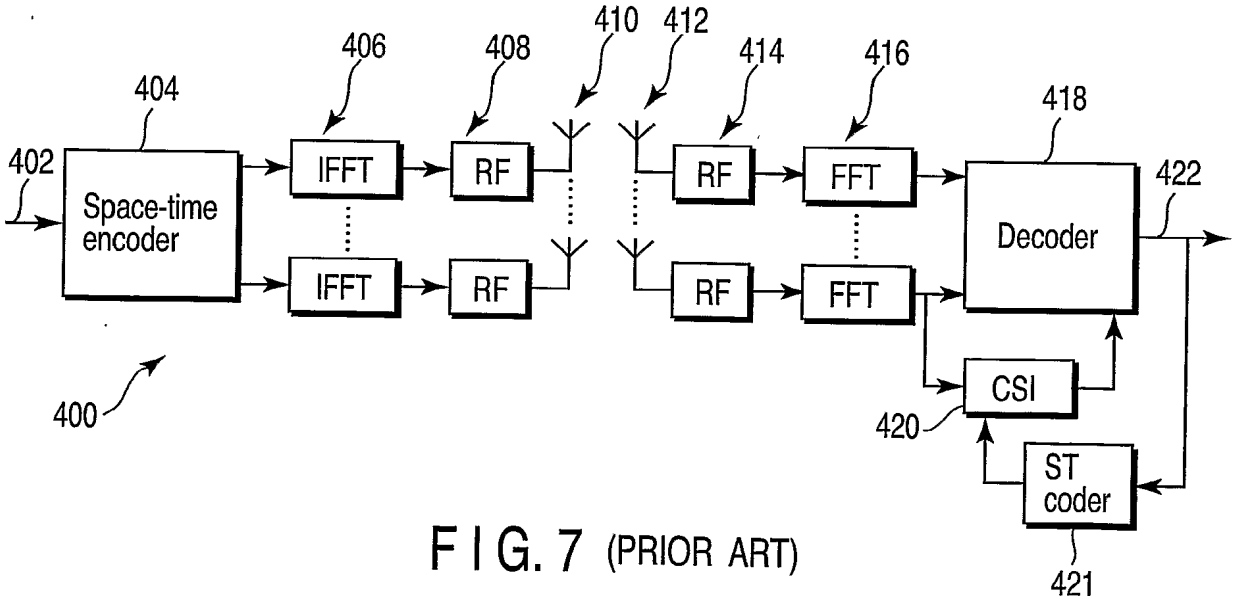


FIG. 7 (PRIOR ART)

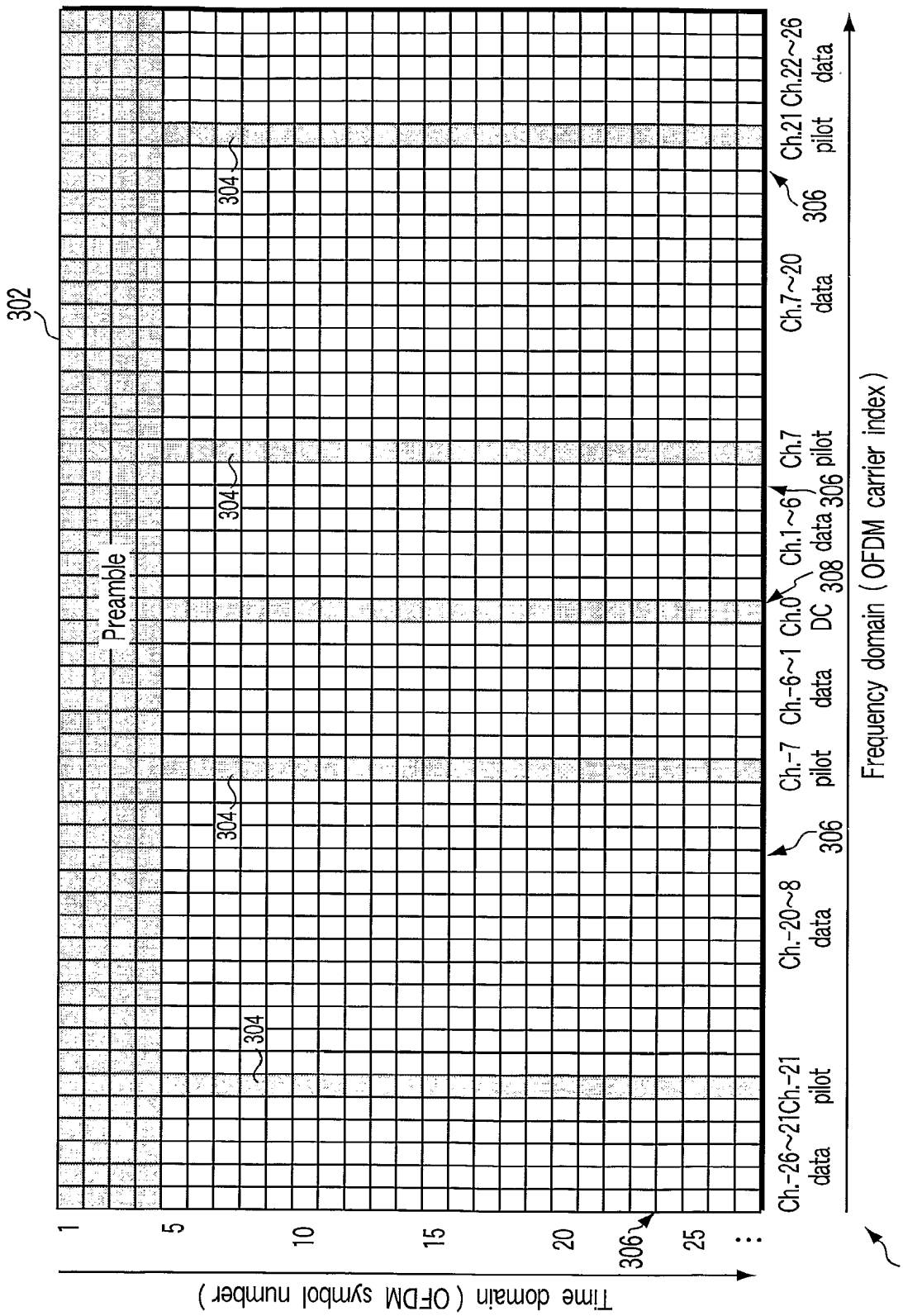

302
Preamble
304
306
300
Time domain (OFDM symbol number)
Frequency domain (OFDM carrier index)
1
5
10
15
20
25
...
Ch.-26~21 data
Ch.-21 pilot
Ch.-20~8 data
Ch.-7 pilot
Ch.-6~1 data
Ch.0 DC
Ch.1~6 data
Ch.7 pilot
Ch.7~20 data
Ch.21 pilot
Ch.22~26 data

FIG. 6

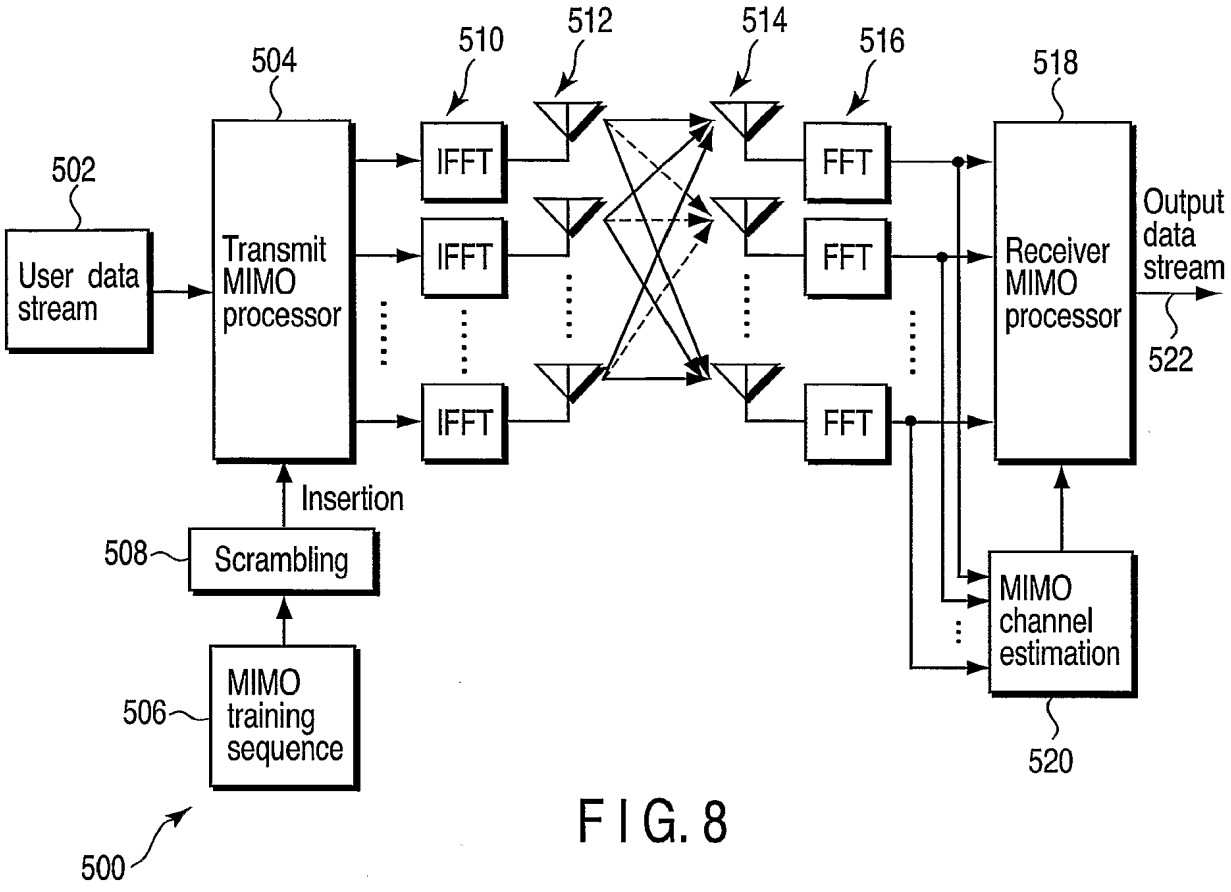

502
User data stream
504
Transmit MIMO processor
510
512
514
516
518
IFFT
IFFT
IFFT
FFT
FFT
FFT
Receiver MIMO processor
Output data stream
522
Insertion
508
Scrambling
506
MIMO training sequence
MIMO channel estimation
520
500

FIG. 8

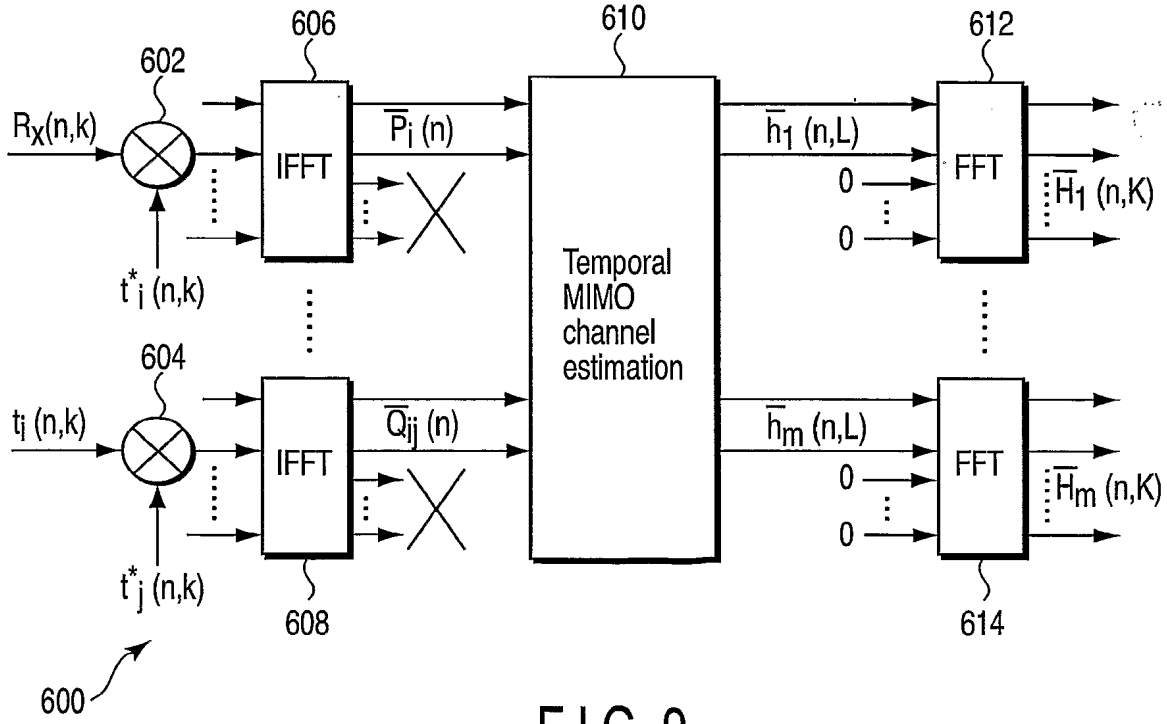

606
610
612
602
$R_X(n,k)$
IFFT
$\overline{P}_i(n)$
$\overline{h}_1(n,L)$
0
0
FFT
$\overline{H}_1(n,K)$
$t^*_i(n,k)$
Temporal MIMO channel estimation
604
$t_j(n,k)$
IFFT
$\overline{Q}_{ij}(n)$
$\overline{h}_m(n,L)$
0
0
FFT
$\overline{H}_m(n,K)$
$t^*_j(n,k)$
608
614
600

FIG. 9

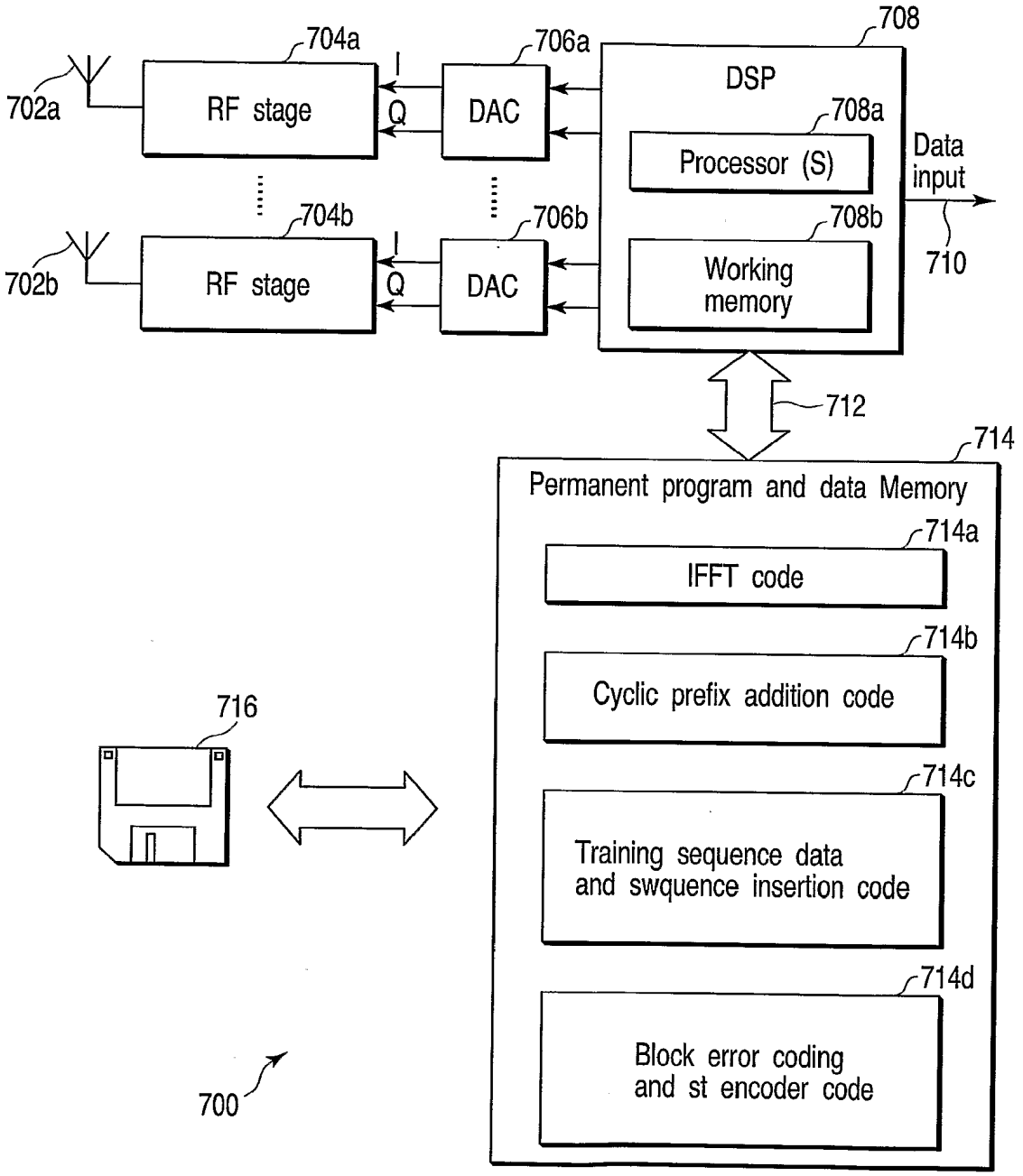

708
704a
706a
DSP
702a
RF stage
I
Q
DAC
708a
Processor (S)
Data input
704b
706b
708b
702b
RF stage
I
Q
DAC
Working memory
710
712
714
Permanent program and data Memory
714a
IFFT code
714b
Cyclic prefix addition code
716
714c
Training sequence data and swquence insertion code
714d
Block error coding and st encoder code
700

FIG. 10

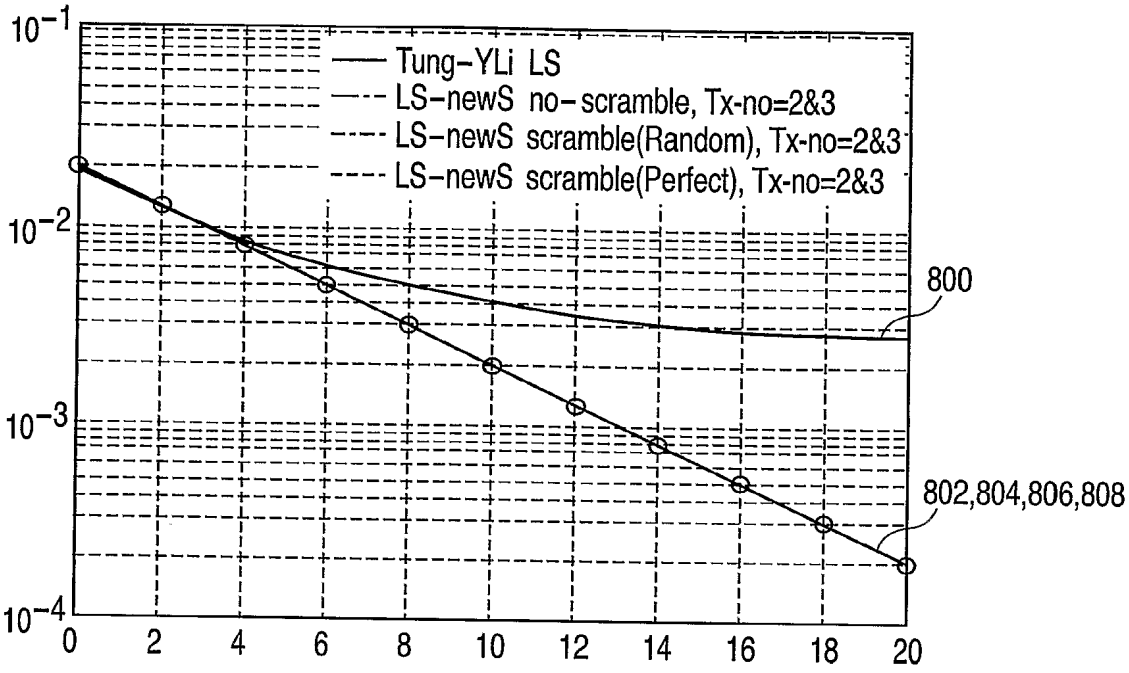

Tung-YLi LS
LS-newS no-scramble, Tx-no=2&3
LS-newS scramble(Random), Tx-no=2&3
LS-newS scramble(Perfect), Tx-no=2&3
800
802,804,806,808
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0 2 4 6 8 10 12 14 16 18 20

FIG. 11

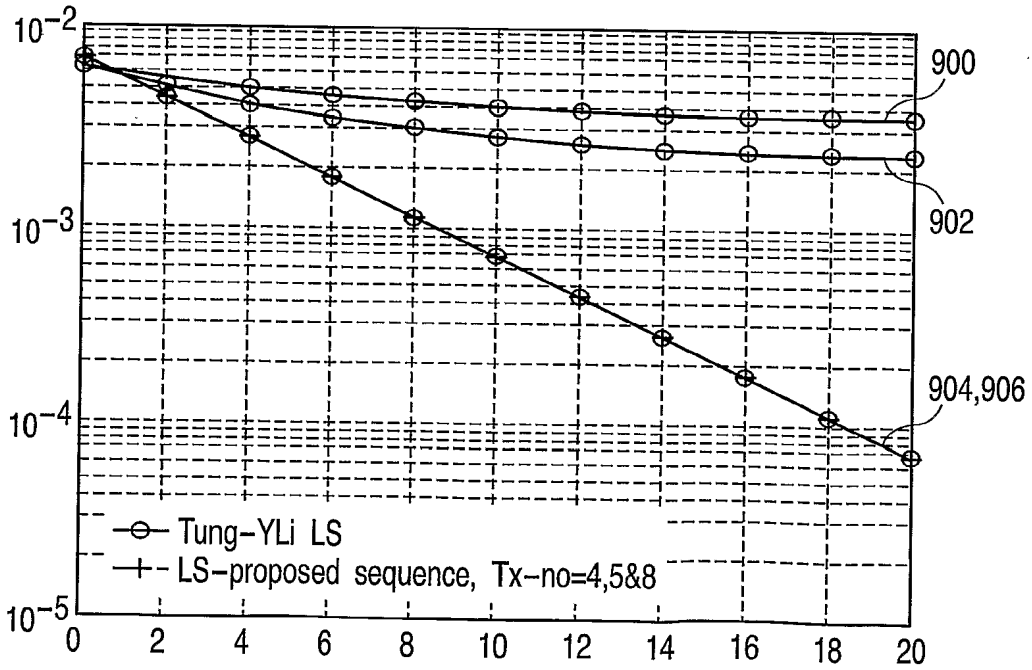

900
902
904,906
Tung-YLi LS
LS-proposed sequence, Tx-no=4,5&8
10^{-2}
10^{-3}
10^{-4}
10^{-5}
0 2 4 6 8 10 12 14 16 18 20

FIG. 12

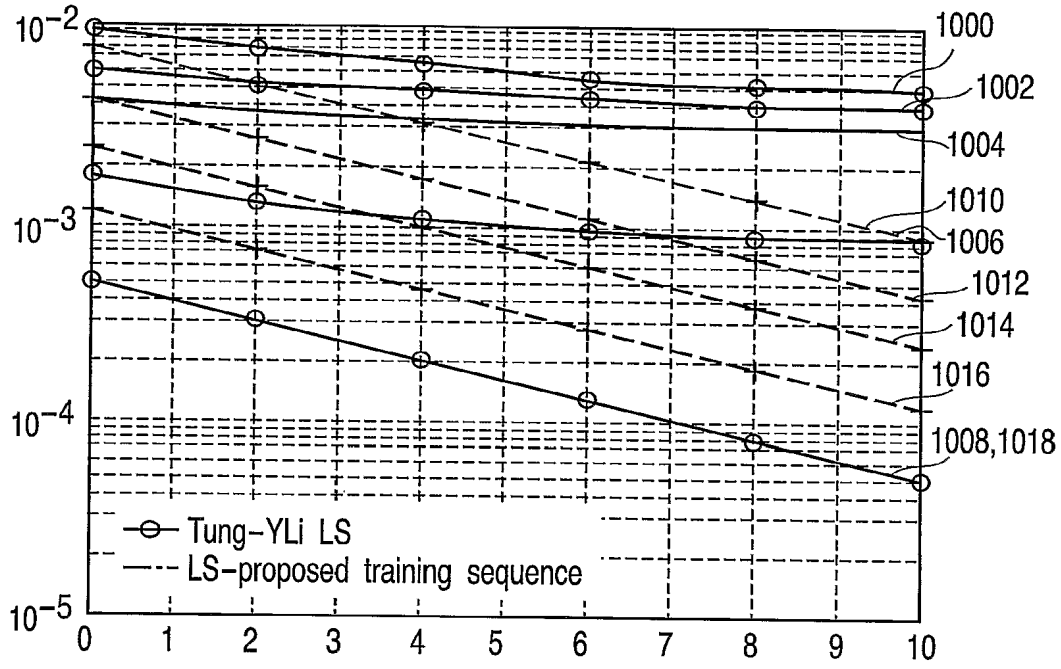

10^{-2}
10^{-3}
10^{-4}
10^{-5}
0
1
2
3
4
5
6
7
8
9
10
1000
1002
1004
1010
1006
1012
1014
1016
1008,1018
Tung-YLi LS
LS-proposed training sequence

FIG. 13

INTERNATIONAL SEARCH REPORT

International Application No
PCT/JP 03/12247

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L1/06 H04L25/02 H04L27/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, INSPEC, COMPENDEX, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	LI Y: "SIMPLIFIED CHANNEL ESTIMATION FOR OFDM SYSTEMS WITH MULTIPLE TRANSMIT ANTENNAS" IEEE TRANSACTIONS ON WIRELESS COMMUNICATIONS, IEEE, PISCATAWAY, US, vol. 1, no. 1, January 2002 (2002-01), pages 67-75, XP001143806 ISSN: 1536-1276 * section III *	1-28

☐ Further documents are listed in the continuation of box C.

☐ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 March 2004	09/03/2004

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Orozco Roura, C

Form PCT/ISA/210 (second sheet) (July 1992)

Electronic Acknowledgement Receipt

EFS ID:	38859977
Application Number:	16686468
International Application Number:	
Confirmation Number:	2785
Title of Invention:	Backward-Compatible Long Training Sequences for Wireless Communication Networks
First Named Inventor/Applicant Name:	Jason Alexander Trachewsky
Customer Number:	22186
Filer:	Steve Mendelsohn/Eri Yoneda
Filer Authorized By:	Steve Mendelsohn
Attorney Docket Number:	1382.001RE
Receipt Date:	13-MAR-2020
Filing Date:	18-NOV-2019
Time Stamp:	13:47:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	1382_001RE_IDS_Form.pdf	25243 5df450af1f965cc2053fbaf613ee300c07fcb31f	no	2
Warnings:					

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	1382_001RE_PTOSB08a.pdf	613876 a84c9b760e68087422df4d18778ef8b65d6b14f9	no	8
Warnings:					
Information:					
3	Foreign Reference	WO2004030265A1.pdf	3927200 50493e087a26d8e32b028413394370127d5e680b	no	61
Warnings:					
Information:					
4	Non Patent Literature	NPL1_IEEE_Std_802_11a-1999.pdf	1264518 693fe266cacde12b8d3e7d0c748e284cebb280c1	no	90
Warnings:					
Information:					
5	Non Patent Literature	NPL2_OGAWA_MIMO-OFDM.pdf	306850 acf943c3a25b12ca54365d1f0ca2d2f584114078	no	5
Warnings:					
Information:					
6	Non Patent Literature	NPL3_Abhayawardhana_Frequency_Scaled_Time_Domain_Equalization.pdf	286567 29e39a7c6eba0d76b1274ab5d940a3083ddcaa65	no	6
Warnings:					
Information:					
7	Non Patent Literature	NPL4_LIEBETREU_Modifications_to_OFDM_FFT-256_mode.pdf	597211 0dcaac6075b4b13d7957e222eed79a3ba80e0124	no	9
Warnings:					
Information:					
		Total Files Size (in bytes):	7021465		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. 1382.001RE

In re application of: Jason Alexander Trachewsky and Rajendra R. Moorti

Serial No.:	16/686,468	Group No.	3992
Filed:	11/18/2019	Examiner:	Hetul B. Patel
		Phone No.:	(571)272-4184

For: Backward-Compatible Long Training Sequences for Wireless Communication Networks

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In accordance with 37 CFR § 1.56, this is an Information Disclosure Statement (IDS) for the above-captioned U.S. patent application. An IDS Form PTO/SB/08a listing references is enclosed herewith and forms a part hereof. Submission of references is not an admission that those references are in fact prior art.

Certification Under 37 CFR § 1.704(d)

[ ] Each item of information contained in this information disclosure statement: (1) was first cited in any communication from a patent office in a counterpart foreign or international application or from the USPTO, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of this information disclosure statement; or (2) is a communication that was issued by a patent office in a counterpart foreign or international application or by the USPTO, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of this information disclosure statement. (See the attached PTO/SB/133)

Certification Under 37 CFR § 1.97(e)

[ ] (1) Each item of information contained in this information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement.

[ ] (2) No item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of this information disclosure statement.

Fee Under 37 CFR § 1.97(c)

[ ] The fee for submission of this IDS under § 1.97(c) is $240.00 as set forth in § 1.17(p).

Fee Under 37 CFR § 1.97(d)

[ ] The fee for submission of this IDS under § 1.97(d) is $240.00 as set forth in § 1.17(p).

Submission Under 37 CFR § 1.97(i)

[ ] This IDS is being submitted under § 1.97(i). Please place the IDS in the file pursuant to § 1.97(i).

Provision of Copies of Non-Patent Literature (NPL)/Foreign References

[X] Copies of the NPL references are enclosed herewith and form a part hereof.

[X] Copies of the foreign references are enclosed herewith and form a part hereof.

[ ] The English abstract of reference _____ is enclosed herewith and forms a part hereof.

[ ] A copy of the International Search Report from a corresponding PCT application is enclosed herewith.

[ ] A copy of the European Search Report from a corresponding EPO application is enclosed herewith.

[ ] A copy or copies of one or more U.S. office actions and/or a notice of allowance for U.S. patent application no. _____ filed on _____ as attorney docket no. _____ is/are enclosed herewith.

[ ] The above-captioned U.S. patent application is a
[ ] continuation
[ ] divisional
[ ] continuation-in-part

application of U.S. application serial number_____, filed on _____as Attorney Docket No. _____. Each of the listed references except the office actions and/or notice of allowance from such prior application was previously cited by or submitted to the Office in the prior application. The above-captioned U.S. patent application relies upon the prior application for an earlier filing date under 35 U.S.C. 120. Pursuant to § 1.98(d), copies of such listed references are not being provided with this IDS.

Authorization to Charge Credit Card Account

[ ] Electronic credit card payment is being made in the amount of $ 240.00.

Authorization to Charge Deposit Account

[X] Authorization is given to charge Mendelsohn Dunleavy, P.C. Deposit Account No. 50-0782 any deficiency or credit any overpayment for any fee under § 1.97(c) or § 1.97(d).

It is respectfully requested that the Examiner initial and return a copy of the enclosed PTO/SB/08a form as confirmation that each of the documents has been considered.

Respectfully submitted,

Date: 03/13/2020
Customer No. 22186
Mendelsohn Dunleavy, P.C.
1500 John F. Kennedy Blvd., Suite 312
Philadelphia, Pennsylvania 19102

/Steve Mendelsohn/
Steve Mendelsohn
Registration No. 35,951
Attorney for Applicant
(215) 557-6657

Enclosures

NXP - Exhibit 1004 - Page 204

Litigation Search Report CRU 3999

Reissue Application No.: 16/686,468

TO: Hetul Patel
Location: CRU
Art Unit: 3992
Date: February 13, 2020

U.S. Patent Number: 7,990,842

From: Patricia Martin
Paralegal Specialist
Location: CRU 3999
Phone: (571) 272-7705

Search Notes

1) I performed a search on the patent in Lexis Court Link for any open dockets or closed cases.

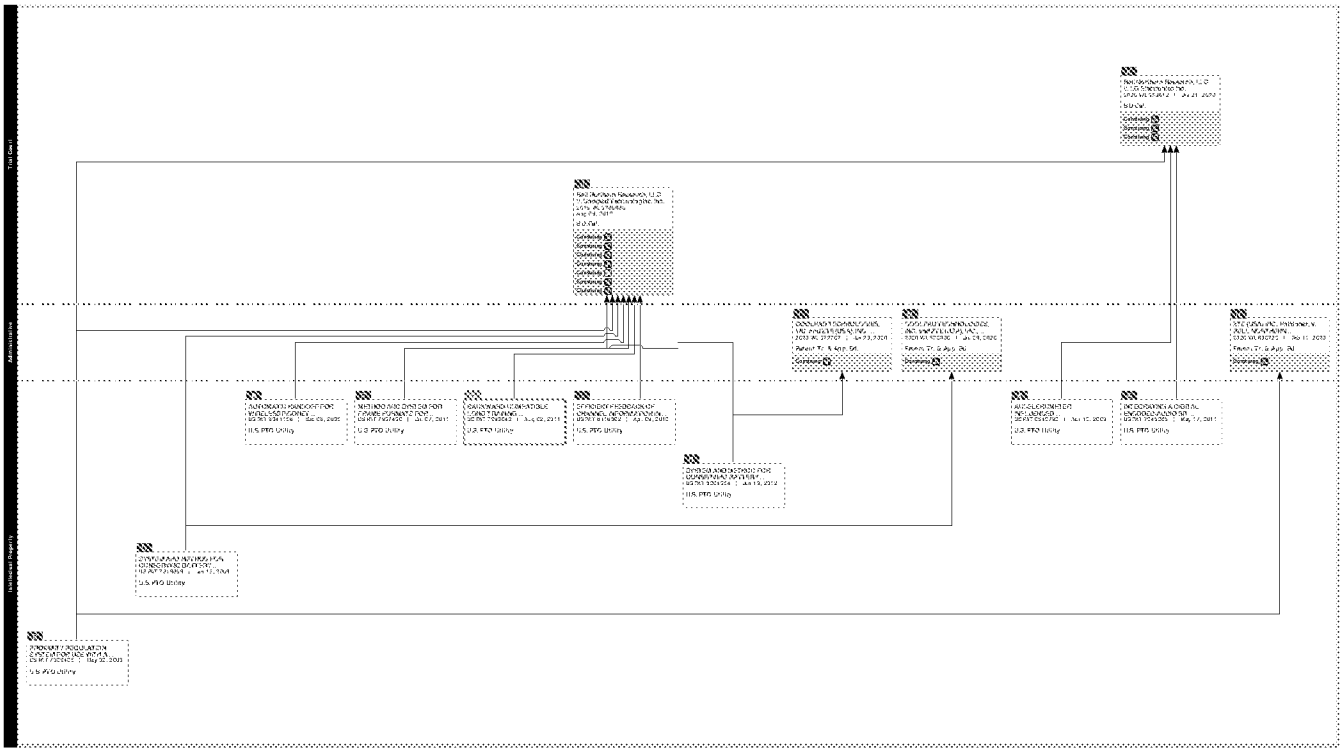
2) I performed a Key Cite Search in Westlaw, which retrieves all history on the patent including any litigation.

3) I performed a search in Lexis in the Federal Courts and Administrative Materials databases for any cases found.

4) I performed a search in Lexis in the IP Journal and Periodicals database for any articles on the patent.

5) I performed a search in Lexis in the news databases for any articles about the patent or any articles about litigation on this patent.

No Litigation was found



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History (28)

Direct History (22)

1. ACCELEROMETER INFLUENCED COMMUNICATION DEVICE
US PAT 6549792 , U.S. PTO Utility , Apr. 15, 2003

Construed by

2. Bell Northern Research, LLC v. LG Electronics Inc.
2020 WL 353612 , S.D.Cal. , Jan. 21, 2020

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3. AUTOMATIC HANDOFF FOR WIRELESS PICONET MULTIMODE CELL PHONE
US PAT 6941156 , U.S. PTO Utility , Sep. 06, 2005

Construed by

4. Bell Northern Research, LLC v. Coolpad Technologies, Inc.
2019 WL 3766688 , S.D.Cal. , Aug. 09, 2019

---

5. PROXIMITY REGULATION SYSTEM FOR USE WITH A PORTABLE CELL PHONE AND A METHOD OF OPERATION THEREOF
US PAT 7039435 , U.S. PTO Utility , May 02, 2006

Construed by

6. Bell Northern Research, LLC v. Coolpad Technologies, Inc.
2019 WL 3766688 , S.D.Cal. , Aug. 09, 2019

AND Construed by

7. Bell Northern Research, LLC v. LG Electronics Inc.
2020 WL 353612 , S.D.Cal. , Jan. 21, 2020

AND Construed by

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8. ZTE (USA) INC., Petitioner, v. BELL NORTHERN RESEARCH, LLC, Patent Owner.
2020 WL 698725 , Patent Tr. & App. Bd. , Feb. 11, 2020

---

9. SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION Out Of Pass
US PAT 7319889 , U.S. PTO Utility , Jan. 15, 2008

Construed by

10. Bell Northern Research, LLC v. Coolpad Technologies, Inc.
2019 WL 3766688 , S.D.Cal. , Aug. 09, 2019

AND Construed by

11. COOLPAD TECHNOLOGIES, INC. and ZTE (USA), INC., Petitioners, v. BELL NORTHERN RESEARCH, LLC, Patent Owner.
2020 WL 573300 , Patent Tr. & App. Bd. , Jan. 29, 2020

---

12. INTEGRATING A DIGITAL ENCODED-AUDIO BIT STREAM PLAYER IN A RADIO-FREQUENCY TELEPHONE HANDSET Out Of Pass
US PAT 7945285 , U.S. PTO Utility , May 17, 2011

Construed by

13. Bell Northern Research, LLC v. LG Electronics Inc.
2020 WL 353612 , S.D.Cal. , Jan. 21, 2020

---

14. METHOD AND SYSTEM FOR FRAME FORMATS FOR MIMO CHANNEL MEASUREMENT EXCHANGE Out Of Pass
US PAT 7957450 , U.S. PTO Utility , June 07, 2011

Construed by

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15. Bell Northern Research, LLC v. Coolpad Technologies, Inc.
2019 WL 3766688 , S.D.Cal. , Aug. 09, 2019

16. BACKWARD-COMPATIBLE LONG TRAINING SEQUENCES FOR WIRELESS COMMUNICATION NETWORKS Out Of Pass
US PAT 7990842 , U.S. PTO Utility , Aug. 02, 2011

Construed by

17. Bell Northern Research, LLC v. Coolpad Technologies, Inc.
2019 WL 3766688 , S.D.Cal. , Aug. 09, 2019

18. SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION Out Of Pass
US PAT 8204554 , U.S. PTO Utility , June 19, 2012

Construed by

19. Bell Northern Research, LLC v. Coolpad Technologies, Inc.
2019 WL 3766688 , S.D.Cal. , Aug. 09, 2019

AND Construed by

20. COOLPAD TECHNOLOGIES, INC. and ZTE (USA), INC., Petitioners, v. BELL NORTHERN RESEARCH, LLC, Patent Owner.
2020 WL 572707 , Patent Tr. & App. Bd. , Jan. 29, 2020

21. EFFICIENT FEEDBACK OF CHANNEL INFORMATION IN A CLOSED LOOP BEAMFORMING WIRELESS COMMUNICATION SYSTEM Out Of Pass
US PAT 8416862 , U.S. PTO Utility , Apr. 09, 2013

Construed by

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22. Bell Northern Research, LLC v. Coolpad Technologies, Inc.
2019 WL 3766688 , S.D.Cal. , Aug. 09, 2019

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23. Bell Northern Research, LLC v. ZTE Corporation
2019 WL 1590472 , S.D.Cal. , Apr. 12, 2019

24. Bell Northern Research, LLC v. CoolPad Technologies, Inc.
2019 WL 3782183 , S.D.Cal. , Aug. 12, 2019

25. Bell Northern Research, LLC v. Huawei Device (Dongguan) Co., Ltd.
2019 WL 3843086 , S.D.Cal. , Aug. 15, 2019

26. Bell Northern Research, LLC v. Huawei Device (Dongguan) Co., Ltd.
2019 WL 4110529 , S.D.Cal. , Aug. 29, 2019

27. Coolpad Technologies, Inc. v. Bell Northern Research, LLC
2019 WL 6720083 , Patent Tr. & App. Bd. , Dec. 09, 2019

28. Bell Northern Research, LLC v. Coolpad Technologies, Inc.
2020 WL 353630 , S.D.Cal. , Jan. 21, 2020

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User Name: PATRICIA MARTIN
Date and Time: Thursday, February 13, 2020 9:40:00 AM EST
Job Number: 109953394

Results List (includes up to 250)

1. Results list for:7990842 or 7,990,842
   Client/Matter: -None-
   Terms: 7990842 or 7,990,842
   Search Type: Terms and Connectors
   Narrowed by:

Content Type	Narrowed by
Dockets	Case Status: Open,Unknown,Closed

Dockets

1. IPR2019-01174, Huawei Technologies Co., Ltd. Vs. Unknown Defendant

... Yes Prosecution History of the '842 patent 2019-06-12 U.S. Pat. No. **7,990,842** 24845626 Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1001...
... review Technical Center Number 2400 Patent Application Number 12684650 Patent Number **7990842** Huawei Technologies Co., Ltd. P Petitioner HUAWEI TECHNOLOGIES CO LTD 2019-06-12T23:00:20.730 ...
... Jacob Robert Munford 2019-06-12 Petition for Inter Partes Review of USP **7,990,842** 24845635 Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 2...
... Type: EXHIBITS Paper/Exhibit No: 1004 Public? Yes U.S. Pat. No. 7,453,793 **7,990,842** ...

Court: Patent Trial and Appeal Board | **Date:** Jun 12, 2019

2. IPR2019-01345, ZTE (USA) Inc. Vs. Unknown Defendant

... Patent 2019-07-18 Petition for Inter Parties Review of U.S. Patent No. **7,990,842** 25429803 Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 3...
... review Technical Center Number 2400 Patent Application Number 12684650 Patent Number **7990842** ZTE (USA) Inc. P Petitioner ZTE USA INC 2019-07-18T23:00:37.787 2019-07-18 Comparison ...
... Paper/Exhibit No: 1003 Public? Yes Wells Declaration 2019-07-18 U.S. Patent No. **7,990,842** 25429812 Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1001...
... Paper/Exhibit No: 1 Public? Yes Power of Attorney ZTE (USA) Inc. **7,990,842** ...

Court: Patent Trial and Appeal Board | **Date:** Jul 18, 2019

3. IPR2019-01437, ZTE Corporation Vs. Unknown Defendant

... review Technical Center Number 2400 Patent Application Number 12684650 Patent Number **7990842** ZTE Corporation P Petitioner ZTE CORPORATION 2019-08-06T23:00:14.450 2019-08-05 ZTE's Power of ...
... 2 Public? Yes Coolpad's Power of Attorney 2019-08-05 U.S. Patent No. **7,990,842** (Trachewsky et al.) (the '842 patent) 25741140 Filed By: petitioner Document ...

Court: Patent Trial and Appeal Board | **Date:** Aug 05, 2019

4. 3:18cv1784, Bell Northern Research, Llc V. Huawei Device Co., Ltd. Et Al

... for conserving battery power in a mobile station 2012-06-19 455 574 **7,990,842** Backward-compatible long training sequences for wireless communication networks 2011-08-02 370 208 ...
... of an action regarding patent and/or trademark number(s) *7,319,889*, *8,204,554*, * **7,990,842** *, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (tcf) (dsn) (Entered: 08/02/2018) 5405388165 2020-02-11 ...
... of an action regarding patent and/or trademark number(s) *7,319,889*, *8,204,554*, * **7,990,842***, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (tcf) (dsn) (Entered: 08/02/2018)...
... Patent and Trademark Closing, regarding patent and/or trademark number(s) 7,319,889, 8,204,554, **7,990,842** , 8,416,862, 6,941,156, 8,792,432, re 128 Order on Motion to Dismiss. ...

... Patent and Trademark Closing, regarding patent and/or trademark number(s) 7,319,889, 8,204,554, **7,990,842** , 8,416,862, 6,941,156, 8,792,432, re 128 Order on Motion to Dismiss. ...

Court: California Southern District Court | **Date**: Aug 01, 2018

5. 3:18cv1783, Bell Northern Research, Llc V Coolpad Technologies, Inc. Et Al

... of an action regarding patent and/or trademark number(s) *7,319,889*, *8,204,554*, * **7,990,842** *, *6,941,156*, *8,792,432* cc:USPTO (sjt) (dsn) (Entered: 08/02/2018) 5405863883 2020-02-12 REPORT ...
... of an action regarding patent and/or trademark number(s) *7,319,889*, *8,204,554*, * **7,990,842***, *6,941,156*, *8,792,432* cc:USPTO (sjt) (dsn) (Entered: 08/02/2018)...
... for conserving battery power in a mobile station 2012-06-19 455 574 **7,990,842** Backward-compatible long training sequences for wireless communication networks 2011-08-02 370 208 ...

Court: California Southern District Court | **Date**: Aug 01, 2018

6. 3:18cv1785, Bell Northern Research, Llc V. Kyocera Corporation Et Al

... of an action regarding patent and/or trademark number(s) *7,319,889*, *8,204,554*, * **7,990,842** *, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (sjt) (dsn) (Entered: 08/02/2018) 5405389816 2020-02-11 ...
... of an action regarding patent and/or trademark number(s) *7,319,889*, *8,204,554*, * **7,990,842***, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (sjt) (dsn) (Entered: 08/02/2018)...
... for conserving battery power in a mobile station 2012-06-19 455 574 **7,990,842** Backward-compatible long training sequences for wireless communication networks 2011-08-02 370 208 ...

Court: California Southern District Court | **Date**: Aug 01, 2018

7. 3:18cv1786, Bell Northern Research, Llc V. Zte Corporation Et Al

... of an action regarding patent and/or trademark number(s) *7,319,889*, *8,204,554*, * **7,990,842** *, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (tcf) (Entered: 08/02/2018) 5405390636 2020-02-11 REPORT ...
... of an action regarding patent and/or trademark number(s) *7,319,889*, *8,204,554*, * **7,990,842***, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (tcf) (Entered: 08/02/2018)...
... for conserving battery power in a mobile station 2012-06-19 455 574 **7,990,842** Backward-compatible long training sequences for wireless communication networks 2011-08-02 370 208 ...

Court: California Southern District Court | **Date**: Aug 01, 2018

8. 3:18cv2864, Bell Northern Research, Llc V. Lg Electronics, Inc. Et Al

... or determination of an action regarding patent and/or trademark number(s) * **7,990,842** *, *8,416,862*, *7,957,450*, *6,941,156*, *8,792,432*, *7,039,435*, *6,549,792*, *7,945,285* cc:USPTO (tcf) (Entered: ...
... or determination of an action regarding patent and/or trademark number(s) * **7,990,842** *, *8,416,862*, *7,957,450*, *6,941,156*, *8,792,432*, *7,039,435*, *6,549,792*, *7,945,285* cc:USPTO (tcf) (Entered: ...
... US District Court for the Southern District of California 2018-12-20 5V12-CJ81-DXDT-G4C2-00000-00 **7,990,842** Backward-compatible long training sequences for wireless communication networks 2011-08-02 370 208 ...

Court: California Southern District Court | **Date**: Dec 20, 2018

9. HOWARD, GERALD FREEMAN AND HOWARD, JUDY

... of filing fee for Voluntary Petition(17-10417) [misc,volp7] (335.00). Receipt number **7990842** (re:Doc#1) (U.S. Treasury) (Entered: 04/24/2017) https://ecf.kywb.uscourts.gov/doc1/082015138769 125420413 Receipt of filing fee for Voluntary Petition(17-10417) [misc,volp7] (335.00). Receipt number **7990842** (re:Doc#1) (U.S. Treasury) (Entered: 04/24/2017)...
... of filing fee for Voluntary Petition(17-10417) [misc,volp7] (335.00). Receipt number **7990842** (re:Doc#1) (U.S. Treasury) (Entered: 04/24/2017) 2017-04-24 RECEIPT OF FILING FEE FOR VOLUNTARY PETITION(17-10417) [MISC,VOLP7] (335.00). RECEIPT NUMBER **7990842** (RE:DOC# 1) (U.S. TREASURY)(ENTERED: 04/24/2017) Events since last full update ...
... OF FILING FEE FOR VOLUNTARY PETITION(17-10417) [MISC,VOLP7] (335.00). RECEIPT NUMBER **7990842** (RE:DOC# 1) (U.S. TREASURY)(ENTERED: 04/24/2017)...

Court: Kentucky Western Bankruptcy Court | **Date:** Apr 24, 2017

10. Jeffery Joseph Richter

... filed by AH BENNETT CO, Amount claimed: $51286.22 Grace MNBM https://ecf.mnb.uscourts.gov/cgi-bin/show_doc.pl?caseid=323329&claim_id= **7990842** &claim_num=8-1&magic_num=MAGIC 232147791 Claim #8 filed by AH BENNETT CO, Amount claimed: ...
... $7194.80 $7194.80 Original Filing Date: 05/25/2010 Original Enter Date: 05/25/2010 https://ecf.mnb.uscourts.gov/cgi-bin/show_doc.pl?caseid=323329&claim_id= **7990842** &claim_num=8-1&magic_num=MAGIC 9-1 AH BENNETT CO 900 GLENWOOD AVE MINNEAPOLIS MN 55405 ...

Court: Minnesota Bankruptcy Court | **Date:** Dec 04, 2009

11. 04-1-00353-0. State of Washington Vs. TIA M PACE

... 7990841 EntryCode: CTRN Court Reporter Notes Kk 28 2008-01-25 Motion Hearing **7990842** EntryCode: MTHRG Motion Hearing 29 2008-02-20 Order Denying Motion/petition 7990843 EntryCode: ...

Court: Chelan County Superior Court | **Date:** Jun 01, 2004

12. ANNORENO KATHRYN Vs. HOULIHANS RESTAURANT INC And IL CORP SERVICE C

... Judge:MURPHY JAMES R Clerk:CAB M 7990841 2014-08-07 Order for Deposition fld **7990842** - Judge:MURPHY JAMES R Clerk:EM2 M 7990843 all parties by 10/7/14 ...

Court: Kane County Circuit Court | **Date:** Jan 06, 2014

13. AT & T ADVERTISING LP ET AL vs. REEVES ET AL

... Assigned to Case 7990843 2010-06-23 FILE STAMP 6/23/2010, PETITION ON CONTRACT **7990842** 2010-06-23 FILE STAMP 6/23/2010, REQUEST AND SERVICE INSTRUCTION FORM 7990841 2010-06-23 ...

Court: Johnson County District Court | **Date:** Jun 23, 2010

14. BURGESS,ANNIE AND WASHINGTON,ROSA LEE v. BURGESS,ANNIE AND WASHINGTON,ROSA LEE

... *FILED PRO SE BY ROSA LEE WASHINGTON 2000-01-04 COMPLAINT FILED **7990842** Code CMPL COMPLAINT FILED ...

Court: Seminole Circuit & County Court | **Date:** Jan 04, 2000

15. CARNEY, WILLIAM L et al v. CASEY, JOHN L et al

... ANSWER W/ATT 7990837 ANSWER W/ATT 1990-03-26 ANSWER 7990839 ANSWER 1990-03-26 ANSWER **7990842** ANSWER 1990-03-26 ANSWER W/ATT 7990852 ANSWER W/ATT 1990-03-26 ANSWER W/ATT 7990867 ...

Court: Orange Circuit & County Court | **Date:** Mar 02, 1990

16. CHRISTOPHER A. JONES VS. DONALD YORK EVANS D6

... ** Execution issued 7990843 2015-01-15 2645 - Opposition to Mtn ... **7990842** Details Opposition to Motion to Strike - Transaction 4775485 - Approved ...

Court: DeNA | **Date:** Mar 13, 2014

17. Christopher Jakobiak, Plaintiff, vs.Jillian Jakobiak, Defendant.

... Seminar Completion EDCR 5.07 2007-06-19 Receipt of Copy 7990841 2007-06-19 Supplemental **7990842** EntryDetails: Affidavit 2007-06-26 Supplemental 7990843 EntryDetails: Affidavit in Support of Defendants ...

Court: Clerk of courts | **Date:** May 21, 2007

18. EDWARD L GOLDBECK SR v. MICHAEL J PETERSON ETUX

... Type INTENTION TO TAKE DEPO 00007 1996-03-22 OF MICHAEL J PETERSON **7990842** Type AMENDED INTENT TO TAKE DEPO 00008 1996-03-22 OF LINDA PETERSON ...

Court: Bexar County District Court | **Date:** Jan 30, 1996

19. FRANCES MARIE PRADO

... Party: PRADO, LEE ANTHONY 2011-01-07 ORDER/NOTICE OF ADMINISTRATIVE WRIT OF WITHHOLDING **7990842** Filing Party: PRADO, LEE ANTHONY...

Court: Travis County Court | **Date:** May 24, 2004

20. FREDDIE LEE BROWN V AMANDA CRYSTAL SIMMONS -NON-TRIAL

... Description SUMMONS SUBPOENA FEE 21-6-402 Name KNOLLMEYER, MICHAEL J 2018-04-03 none. **7990842** Description SUMMONS ISSUED Name KNOLLMEYER, MICHAEL J 2018-04-03 none. 7990843 Description ...

Court: Pulaski County Circuit Court | **Date:** Apr 03, 2018

21. GEORGE REX ANDERSON III V. TASHA ROSE WILLIAMS

... HEARING ORDER- SIGNED 7990841 Source: Order DateEntered: 01/24/2003 2003-01-27 PSYCHOLOGICAL EVALUATION **7990842** Source: Fees DateEntered: 01/27/2003 2003-01-27 PSYCHOLOGICAL EVALUATION ON ANDY 7990843 Source: ...

Court: Collin County District Court | **Date:** Nov 14, 2001

22. IMO-APPLICATION FOR NAME CHANGE AND HALL, RAY LEE Vs. HALL, JESSE RAY

... FOR NAME CHANGE 3 2009-03-25 INDEX NUMBER APPLICATION
 Control Number:200903250347 **7990842** Amount: $0.00 INDEX NUMBER APPLICATION...

Court: Monroe County Clerk Records | **Date:** Mar 25, 2009

23. Ivanusic vs Ivanusic 004

... Supplement Attachment Sealed) (The filing fee for this petition is $260.75) **7990842** Docket Type Temporary PFA Order with Custody 2019-01-03 Dated 12/26/18. Temporary ...

Court: Allegheny County Court of Common Pleas | **Date:** Jan 03, 2019

24. J DIPAOLO VS A LAJMIRI

... SRVD: 7990843 EntryComment: PASCO CTY SHERIFF 062107 2007-06-28 NTC OF HEARING **7990842** EntryComment: SET 062907 @8:15AM TEPPER 2007-06-28 NTC OF APPEARANCE - CIVIL ...

Court: Pasco Circuit & County Court | **Date:** Jun 20, 2007

25. Laura M Santiago Petitioner vs. Faynee N Lattimore Respondent

... Text unserved 2015-09-18 Clerk's Certificate of Compliance 7990845 2015-09-18 Temporary Injunction **7990842** ...

Court: Broward Circuit & County Court | **Date:** Aug 06, 2015

26. MARILYN IVISON VS VARSITY

... DISPOSITION UPDATED 7990843 ORIGINAL DISPOSITION UPDATED 2012-12-19 ER: ORDER OF DISMISSAL **7990842** ER: ORDER OF DISMISSAL 2012-12-19 JOINT MOTION/STIP TO DISMISS 7990841 JOINT ...

Court: Brevard Circuit & County Court | **Date:** Feb 11, 2011

27. Mary Coelho vs Steven W Smith

... Dept 51 lmb Domestic Violence OSC 2005-03-11 Minute order Temp Judge **7990842** Entry Time:01:10 PM Entry Comments:Minute Order from Dept.: 51 Temporary Judge: ...

Court: Fresno County Superior Court | **Date:** Feb 14, 2005

28. McKelvey, et al v. Skinner, et al

... support of [13-1] motion for Summary Judgment (jmul) [Entry date 02/17/93] **7990842** MEMORANDUM by pltfs in support of [13-1] motion for Summary Judgment ...

Court: New York Western District Court | **Date:** Oct 15, 1991

29. MCMASTER FINANCIAL Vs. Pratt, Raymond

... FINANCIAL (Plaintiff); 7990843 2007-02-01 Certified Mailing Fee Receipt: 230693 Date: 02/01/2007 **7990842** 2007-02-01 Judgment Debtor Packet Issued 7990841 2007-02-01 Issue Date: 02/01/2007^Service: Judgment ...

Court: Anchorage District and Superior Courts | **Date:** Apr 01, 2003

30. MCOT v. MARION, ROBERT SHAWN AND LIGHT HOUSE SUPPLY

... MARION, ROBERT SHAWN Garnishment Not Found 04/30/07 2007-08-07 ORDER OF DISMISSAL **7990842** Type Order Book: 52 Page: 149 ...

Court: Bristol County Circuit Court | **Date:** Oct 31, 2006

31. MIDL and CREDIT MANAGEMENT vs. FREDDY SHOEMAKER.

... CONTINUING WAGE($ 55.00) Entry Date APR 28 2006 8:45:17:633AM Serial No **7990842** GARNISHMENT AFFIDAVIT W/SUMMONS - CONTINUING WAGE($ 55.00) 0 2006-04-28 OKLAHOMA COURT ...

Court: Cleveland County District Court | **Date:** Feb 02, 2006

32. OAK PLANTATION JOINT VENTURE, VS BING, HERBERT E

... 2002-09-12 DEFAULT AS TO GLORIA W. BLOUNT - COUNT II SW0912 **7990842** 2002-09-11 MOTION FOR DEFAULT AS TO GLORIA W. BLOUNT - COUNT ...

Court: Osceola Circuit & County Court | **Date:** Apr 03, 2002

33. RENAISSANCE SCHOOL vs. SINGLETON, NICOLE

... TO THIS CASE. Entry Date DEC 4 2015 9:30:45:837AM Serial No **7990842** OCIS HAS AUTOMATICALLY ASSIGNED JUDGE HERT, R. L. TO THIS CASE. ...

Court: Payne County District Court | **Date:** Dec 04, 2015

34. RON BARLEY, et al vs. MICHAEL FERNSTRUM

... OF NOTICE DOR; VER: N; K 2011-09-30 NOTICE/REGISTRATION FOREIGN SUPPORT ORDER **7990842** Details Comment:: NOTICE/REGISTRATION OF FOREIGN SUPPORT ORDER/MODIFICATION; VER: F; K 2011-09-30 ...

Court: Pinellas Circuit & County Court | **Date:** Dec 31, 2009

35. SHAWNEE CO HEALTH DEPARTMENT Vs. MATHEWS,HENRY

... Electronic Request for Accusation in contempt filed by THOMAS A VALENTINE **7990842** 2005-09-28 Citation issued first class mail returnable 10/18/05 08:30A.M. as to ...

Court: Shawnee County District Court | **Date:** Apr 25, 2005

36. STATE OF FLORIDA v. AVALOS, ALBERT LOPEZ

... 273120991 2008-12-12 PD APPLICATION FEE REVERSED PURSUANT TO F.S. 939.06 37653563 **7990842** 2001-08-17 NOTICE TO THE CLERK FILED 37653564...

Court: Lee Circuit & County Court | **Date:** Jul 16, 2001

37. State of Washington, Respondent v. Wesley A. Stanger, Appellant

... Rickert, cr J. Schroeder, rec'd in this court on 6/25/09 2009-06-24 **7990842** Description Amended SOA Participant SILVERSTEIN, LILA JANE - Attorney 2009-07-07 7990846 ...

Court: Appeals Division 1 | **Date:** Oct 28, 2008

38. TALARICO, BELLINGHAM, LINROLOGY VS BARBARA TURNER AND HURLEY TURNER

... Type Status Disposition Date TALARICO, BELLINGHAM, LINROLOGY BARBARA TURNER HURLEY TURNER **7990842** ...

Court: Monmouth County Superior Court | **Date:** May 31, 1995

39. VALENTIN, FINDA N vs. CONCEPCION, RAFAEL

... Code NCAN 3 1987-08-13 (NOTICE OF CANCELLATION) IV-D SERVICES TERMINATED 1-1-87 **7990842** NOTICE OF CANCELLATION Code NCAN 3 1987-08-13 (NOTICE OF CANCELLATION) IV-D ...

Court: Palm Beach Circuit & County Court | **Date:** Sep 20, 1985

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CourtLink®

Results for: 7990842 or 7,990,842

Dockets (8) Sort by: Relevance

1. IPR2019-01174. Huawei Technologies Co., Ltd. Vs. Unknown Defendant

Patent Trial and Appeal Board | Jun 12, 2019 | IPR2019-01174 | Open
... Case Type IPR: Inter partes review Technical Center Number 2400 **Patent** Application Number 12684650 **Patent** Number **7990842** Huawei Technologies Co., Ltd. P Petitioner HUAWEI TECHNOLOGIES CO LTD...
... Jacob Robert Munford 2019-06-12 Petition for Inter Partes Review of USP **7,990,842** 24845635 Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 2...
... Prosecution History of the '842 **patent** 24845627 Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1002 Public? Yes Prosecution History of the '842 **patent** 2019-06-12 U.S. Pat. No. **7,990,842** ...
... Type: EXHIBITS Paper/Exhibit No: 1004 Public? Yes U.S. Pat. No. 7,453,793 **7,990,842** ...
... US **Patent** Trial and Appeals Board - Alexandria US_PTO_ALE ALE Alexandria United States **Patent** Trial and Appeal Board Docket US.PTAB.ALL_IPR2019-01174_ALE IPR2019-01174_ALE 2019-06-12T23:00:00 Unknown NOS Unknown ...

2. IPR2019-01345. ZTE (USA) Inc. Vs. Unknown Defendant

Patent Trial and Appeal Board | Jul 18, 2019 | IPR2019-01345 | Open
... File History of '842 **Patent** 25429804 Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1002 Public? Yes File History of '842 **Patent** 2019-07-18 Petition for Inter Parties Review of U.S. **Patent** No. **7,990,842** ...
... Type: EXHIBITS Paper/Exhibit No: 1003 Public? Yes Wells Declaration 2019-07-18 U.S. **Patent** No. **7,990,842** 25429812 Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1001...
... Paper/Exhibit No: 1 Public? Yes Power of Attorney ZTE (USA) Inc. **7,990,842** ...
... Case Type IPR: Inter partes review Technical Center Number 2400 **Patent** Application Number 12684650 **Patent** Number **7990842** ZTE (USA) Inc. P Petitioner ZTE USA INC 2019-07-18T23:00:37.787...
... Paper/Exhibit No: 1006 Public? Yes U.S. Pub. No. 2005-0286474 2019-07-18 U.S. **Patent** No. 7,453,793 25429814 Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: ...
... No: 1013 Public? Yes Plaintiff's Opening Claim Construction Brief 2019-07-18 156 **Patent** Invalidity Contentions 25429810 Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: ...

3. IPR2019-01437. ZTE Corporation Vs. Unknown Defendant

Patent Trial and Appeal Board | Aug 05, 2019 | IPR2019-01437 | Open
... Paper/Exhibit No: 2 Public? Yes Coolpad's Power of Attorney 2019-08-05 U.S. **Patent** No. **7,990,842** (Trachewsky et al.) (the '842 **patent**) 25741140 Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1101 ...
... Prosecution History of the '842 **patent** 25741142 Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1102 Public? Yes Prosecution History of the '842 **patent** 2019-08-05 U.S. Provisional **Patent** Application No. 60/591,104...
... Filed Case Type IPR: Inter partes review Technical Center Number 2400 **Patent** Application Number 12684650 **Patent** Number **7990842** ZTE Corporation P Petitioner ZTE CORPORATION 2019-08-06T23:00:14.450 2019-08-05 ZTE's Power of ...
... Plaintiff's Opposition to Defendants' Joint Motion for Summary Judgment 2019-08-05 U.S. **Patent** Application Publication No. 2004/0093545 25741160 Filed By: petitioner Document Type: EXHIBITS ...
... 1140 Public? Yes OFDM for High Speed Wireless Networks 2019-08-05 International **Patent** Application Publication WO 02/39598 to Crawford 25741186 Filed By: petitioner Document ...

4. 3:18cv1784. Bell Northern Research, Llc V. Huawei Device Co., Ltd. Et Al

California Southern District Court | Aug 01, 2018 | 3:18cv1784 | Closed
... Ann Bencivengo on 12/3/2019. (anh) (Entered: 12/03/2019) 129 2019-12-03 REPORT of **Patent** and Trademark Closing, regarding **patent** and/or trademark number(s) 7,319,889, 8,204,554, **7,990,842**, 8,416,862, 6,941,156, 8,792,432, re 128 Order on Motion to Dismiss. cc:USPTO (rmc) (Entered: 01/23/2020) 5405388289 2020-02-11 REPORT of **Patent** and Trademark Closing, regarding **patent** and/or trademark number(s) 7,319,889, 8,204,554, **7,990,842** , 8,416,862, 6,941,156, 8,792,432, re 128 Order on Motion to Dismiss. ...
... 2018-08-02 REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,319,889*, *8,204,554*, *7,990,842 *, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (tcf) (dsn) (Entered: 08/02/2018) 5405388165 2020-02-11 ...
... 2020-02-11 REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,319,889*, *8,204,554*, *7,990,842*, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (tcf) (dsn) (Entered: 08/02/2018)...

NXP - Exhibit 1004 - Page 219

... Closed 12/03/2019 CV Civil 830 **Patent** 11 San Diego 2018-08-02T00:00:00 2020-02-12T00:00:00 2018-08-01 0 CLOSED,,,LNO,**PATENT**,PROTO,SEALDC Defendant 0 None Federal Question **Patent** Infringement 35:0271 0 2019-12-03T00:00:00 0 None...
... Interest by Bell Northern Research, LLC . Identifying Corporate Parent Hilco **Patent** Acquisition 56, LLC, Corporate Parent Hilco IP Merchant Capital, LLC, Corporate ...

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5. 3:18cv1783. Bell Northern Research, Llc V Coolpad Technologies, Inc. Et Al

California Southern District Court | Aug 01, 2018 | 3:18cv1783 | Open
... 2018-08-01 REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,319,889*, *8,204,554*, *7,990,842*, *6,941,156*, *8,792,432* cc:USPTO (sjt) (dsn) (Entered: 08/02/2018) 5405863883 2020-02-12 REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,319,889*, *8,204,554*, *7,990,842*, *6,941,156*, *8,792,432* cc:USPTO (sjt) (dsn) (Entered: 08/02/2018)...
... for conserving battery power in a mobile station 2012-06-19 455 574 **7,990,842** Backward-compatible long training sequences for wireless communication networks 2011-08-02 370 208 ...
... 0 Open CV Civil 830 **Patent** 11 San Diego 2018-08-02T00:00:00 2020-02-12T00:00:00 2018-08-01 0 ,,ENE,**PATENT**,PROTO Plaintiff 0 None Federal Question **Patent** Infringement 35:0271 0 2020-02-07T00:00:00 0 3:18cv01786...
... Interest by Bell Northern Research, LLC . Identifying Corporate Parent Hilco **Patent** Acquisition 56, LLC, Corporate Parent Hilco IP Merchant Capital, LLC, Corporate ...
... Interest by Bell Northern Research, LLC . Identifying Corporate Parent Hilco **Patent** Acquisition 56, LLC, Corporate Parent Hilco IP Merchant Capital, LLC, Corporate ...
... Case Management Order Regulating Discovery and Other Pretrial Proceedings in a **Patent** Case. Signed by Magistrate Judge Barbara Lynn Major on 10/23/2018.(anh) (Entered: ...

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6. 3:18cv1785. Bell Northern Research, Llc V. Kyocera Corporation Et Al

California Southern District Court | Aug 01, 2018 | 3:18cv1785 | Closed
... 2018-08-01 REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,319,889*, *8,204,554*, *7,990,842 *, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (sjt) (dsn) (Entered: 08/02/2018) 5405389816 2020-02-11 ...
... 2020-02-11 REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,319,889*, *8,204,554*, *7,990,842*, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (sjt) (dsn) (Entered: 08/02/2018)...
... Closed 08/05/2019 CV Civil 830 **Patent** 11 San Diego 2018-08-02T00:00:00 2020-02-11T00:00:00 2018-08-01 0 CLOSED,,,LNO,**PATENT**,PROTO Both 0 None Federal Question **Patent** Infringement 35:0271 0 2019-08-05T00:00:00 0 None...
... Interest by Bell Northern Research, LLC . Identifying Corporate Parent Hilco **Patent** Acquisition 56, LLC, Corporate Parent Hilco IP Merchant Capital, LLC, Corporate ...
... Interest by Bell Northern Research, LLC . Identifying Corporate Parent Hilco **Patent** Acquisition 56, LLC, Corporate Parent Hilco IP Merchant Capital, LLC, Corporate ...
... for conserving battery power in a mobile station 2012-06-19 455 574 **7,990,842** Backward-compatible long training sequences for wireless communication networks 2011-08-02 370 208 ...
... California Southern US District Court Docket US.DIS.CAS_318cv1785_CASD 3:18cv1785_CASD 2020-02-11T22:55:05.470 Intellectual Property **Patent** Civil Closed 5SY0-Y5D1-DXDT-G3JX-00000-00 93 20200211T225525 3:18cv1785 18cv1785 3:18 cv1785 No. 3:18cv1785 ...

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7. 3:18cv1786. Bell Northern Research, Llc V. Zte Corporation Et Al

California Southern District Court | Aug 01, 2018 | 3:18cv1786 | Open
... 2018-08-02 REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,319,889*, *8,204,554*, *7,990,842*, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (tcf) (Entered: 08/02/2018) 5405390636 2020-02-11 REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,319,889*, *8,204,554*, *7,990,842*, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (tcf) (Entered: 08/02/2018)...
... 0 Open CV Civil 830 **Patent** 11 San Diego 2018-08-02T00:00:00 2020-02-12T00:00:00 2018-08-01 0 ,,LNO,**PATENT**,PROTO Plaintiff 0 None Federal Question **Patent** Infringement 35:0271 0 2020-02-11T00:00:00 0 3:18cv01783...
... Interest by Bell Northern Research, LLC . Identifying Corporate Parent Hilco **Patent** Acquisition 56, LLC, Corporate Parent Hilco IP Merchant Capital, LLC, Corporate ...
... Interest by Bell Northern Research, LLC . Identifying Corporate Parent Hilco **Patent** Acquisition 56, LLC, Corporate Parent Hilco IP Merchant Capital, LLC, Corporate ...
... for conserving battery power in a mobile station 2012-06-19 455 574 **7,990,842** Backward-compatible long training sequences for wireless communication networks 2011-08-02 370 208 ...
... California Southern US District Court Docket US.DIS.CAS_318cv1786_CASD 3:18cv1786_CASD 2020-02-12T20:19:09.240 Intellectual Property **Patent** Civil Open 5SY0-Y5D1-DXDT-G45K-00000-00 217 20200212T201928 3:18cv1786 18cv1786

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3:18 cv1786 No. 3:18cv1786 ...

8. 3:18cv2864. Bell Northern Research, Llc V. Lg Electronics, Inc. Et Al

California Southern District Court | Dec 20, 2018 | 3:18cv2864 | Open

... 2018-12-21 REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,990,842 *, *8,416,862*, *7,957,450*, *6,941,156*, *8,792,432*, *7,039,435*, *6,549,792*, *7,945,285* cc:USPTO (tcf) (Entered: ...

... 2020-02-12 REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,990,842 *, *8,416,862*, *7,957,450*, *6,941,156*, *8,792,432*, *7,039,435*, *6,549,792*, *7,945,285* cc:USPTO (tcf) (Entered: ...

... Interest by Bell Northern Research, LLC . Identifying Corporate Parent Hilco **Patent** Acquisition 56, LLC, Corporate Parent Hilco IP Merchant Capital, LLC, Corporate ...

... Interest by Bell Northern Research, LLC . Identifying Corporate Parent Hilco **Patent** Acquisition 56, LLC, Corporate Parent Hilco IP Merchant Capital, LLC, Corporate ...

... 2018-12-20 0 Open CV Civil 830 **Patent** 11 San Diego 2018-12-21T00:00:00 2020-02-12T00:00:00 2018-12-20 0 ,,ENE,LNO,PROTO,SEALDC Plaintiff 0 None Federal Question **Patent** Infringement 35:0271 0 2020-02-05T00:00:00 0 3:18cv01783 1...

... 1 Complaint,, with Jury Demand [First Amended Answer to Complaint for **Patent** Infringement and Counterclaims], COUNTERCLAIM against Bell Northern Research, LLC by LG ...

... 1 Complaint,, with Jury Demand [First Amended Answer to Complaint for **Patent** Infringement and Counterclaims], COUNTERCLAIM against Bell Northern Research, LLC by LG ...

Content type: Dockets

Terms: 7990842 or 7,990,842

Search Type: Boolean - Fewer Results

Narrow By: Case Status: Open or Unknown or Closed, Search Within Results: Patent

Date and Time: Feb 13, 2020 09:42:08 a.m. EST

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Lexis Advance® CourtLink® 7990842 or 7,990,842 Dockets Client: -None- History Help More

Document: IPR2019-01174, Huawei Technologies Co., Ltd. Vs. Bell Northern Research, ... Actions

Go to 1 of 8 Results list

IPR2019-01174, Huawei Technologies Co., Ltd. Vs. Bell Northern Research, LLC, which is a wholly owned subsidiary of Hilco Patent Acquisition 56, LLC, which is owned by both Hilco IP Merchant Capital, LLC, and Hilco, Inc.

US Patent Trial and Appeals Board - Alexandria

Alexandria

This case was retrieved on 02/13/2020

Header

Case Number: IPR2019-01174
Date Filed: 06/12/2019
Date Full Case Retrieved: 02/13/2020
Status: Closed
Misc: (0) Unknown; Civil

Summary

Court Case Status: Terminated
Case Type: IPR: Inter partes review
Technical Center Number: 2400
Patent Application Number: 12684650
Patent Number: 7990842

Participants

Litigants	Attorneys
Huawei Technologies Co., Ltd. **Petitioner**	
Bell Northern Research, LLC, which is a wholly owned subsidiary of Hilco Patent Acquisition 56, LLC, which is owned by both Hilco IP Merchant Capital, LLC, and Hilco, Inc. **PatentOwner**	

Proceedings

Retrieve Document(s)

	Availability	Date	#	Proceeding Text	Details

	Availability	Date	#	Proceeding Text	Details
	Online	06/12/2019		U.S. Pat. No. 7,453,793	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1004 Public? Yes
	Online	06/12/2019		U.S. Pub. No. 2004/0093545	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1005 Public? Yes
	Online	06/12/2019		U.S. Pub. No. 2005/0286474	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1006 Public? Yes
	Online	06/12/2019		U.S. Pub. No. 2007/0060073	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1008 Public? Yes
	Online	06/12/2019		Plaintiff's Opening Claim Construction Brief	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1013 Public? Yes
	Online	06/12/2019		U.S. Pat. No. 7,990,842	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1001 Public? Yes
	Online	06/12/2019		Prosecution History of the '842 patent	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1002 Public? Yes

	Availability	Date	#	Proceeding Text	Details
	Online	06/12/2019		U.S. Provisional Application Serial No. 60/575,605	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1009 Public? Yes
	Online	06/12/2019		Plaintiff Bell Northern Research, LLC's Patent Rule 3-1 and 3-2 Disclosure of Asserted Claims and Infringement Contentions Against the Huawei Defendants	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1010 Public? Yes
	Online	06/12/2019		Defendants' Joint Opening Claim Construction Brief	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1012 Public? Yes
	Online	06/12/2019		Defendants' Memorandum of Points and Authorities in Support of Their Joint Motion for Summary Judgement on Indefiniteness	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1014 Public? Yes
	Online	06/12/2019		Petitioner's Power of Attorney	Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 1 Public? Yes
	Online	06/12/2019		Defendants' Invalidity Contentions	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1011 Public? Yes
	Online	06/12/2019		IEEE Std 802.11a-1999	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1007 Public? Yes

	Availability	Date	#	Proceeding Text	Details
	Free	06/12/2019		Petition for Inter Partes Review of USP 7,990,842	Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 2 Public? Yes
	Online	06/12/2019		Declaration of Jacob Robert Munford	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1015 Public? Yes
	Online	06/12/2019		Declaration of Dr. Jonathan Wells	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1003 Public? Yes
	Online	06/18/2019		Notice of Accord Filing Date	Filed By: board Document Type: PAPER Paper/Exhibit No: 3 Public? Yes
	Online	07/02/2019		Patent Owner's Mandatory Notices	Filed By: patentowner Document Type: PAPER Paper/Exhibit No: 5 Public? Yes
	Online	07/02/2019		Patent Owner's Power of Attorney	Filed By: patentowner Document Type: PAPER Paper/Exhibit No: 4 Public? Yes
	Online	08/30/2019		Petitioner's Updated Exhibit List	Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 6 Public? Yes

	Availability	Date	#	Proceeding Text	Details
	Online	08/30/2019		Claim Construction Order and Order on Motions for Summary Judgment	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1016 Public? Yes
	Online	10/25/2019		Joint Request to Keep Separate	Filed By: patentowner Document Type: PAPER Paper/Exhibit No: 8 Public? Yes
	Online	10/25/2019		Joint Motion to Terminate	Filed By: patentowner Document Type: PAPER Paper/Exhibit No: 7 Public? Yes
	Online	12/11/2019		DECISIONSettlement Prior to Institution of Trial37 C.F.R. ?? 42.74	Filed By: board Document Type: PAPER Paper/Exhibit No: 9 Public? Yes
	Online	01/08/2020		Petitioner's Request for Refund	Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 10 Public? Yes
	Online	01/21/2020		Notice of Refund	Filed By: board Document Type: PAPER Paper/Exhibit No: 11 Public? Yes

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Document: IPR2019-01345, ZTE (USA) Inc. Vs. Bell Northern Research, LLC, which is a ... Actions

Go to 2 of 8 Results list

IPR2019-01345, ZTE (USA) Inc. Vs. Bell Northern Research, LLC, which is a wholly owned subsidiary of Hilco Patent Acquisition 56, LLC, which is owned by both Hilco IP Merchant Capital, LLC, and Hilco, Inc.

US Patent Trial and Appeals Board - Alexandria

Alexandria

This case was retrieved on 02/13/2020

Header

Case Number: IPR2019-01345
Date Filed: 07/18/2019
Date Full Case Retrieved: 02/13/2020
Status: Closed
Misc: (0) Unknown; Civil

Summary

Court Case Status: Terminated
Case Type: IPR: Inter partes review
Technical Center Number: 2400
Patent Application Number: 12684650
Patent Number: 7990842

Participants

Litigants	Attorneys
ZTE (USA) Inc. **Petitioner**	
Bell Northern Research, LLC, which is a wholly owned subsidiary of Hilco Patent Acquisition 56, LLC, which is owned by both Hilco IP Merchant Capital, LLC, and Hilco, Inc. **PatentOwner**	

Proceedings

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	Availability	Date	#	Proceeding Text	Details

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	Availability	Date	#	Proceeding Text	Details
	Online	07/18/2019		Power of Attorney ZTE (USA) Inc.	Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 1 Public? Yes
	Online	07/18/2019		Power of Attorney Coolpad Technologies, Inc.	Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 2 Public? Yes
	Online	07/18/2019		Petition for Inter Parties Review of U.S. Patent No. 7,990,842	Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 3 Public? Yes
	Online	07/18/2019		File History of '842 Patent	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1002 Public? Yes
	Online	07/18/2019		U.S. Pub. No. 2004-0093545	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1005 Public? Yes
	Online	07/18/2019		IEEE Std 802.11a-1999	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1007 Public? Yes
	Online	07/18/2019		U.S. Pub. No. 2007-0060073	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1008 Public? Yes

	Availability	Date	#	Proceeding Text	Details
	Online	07/18/2019		U.S. Provisional Application Serial No. 60-575,608	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1009 Public? Yes
	Online	07/18/2019		BNR PLR 3.1 Disclosure of Asserted Claims and Infringement Contentions	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1010 Public? Yes
	Online	07/18/2019		156 Patent Invalidity Contentions	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1011 Public? Yes
	Online	07/18/2019		Plaintiff's Opening Claim Construction Brief	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1013 Public? Yes
	Online	07/18/2019		U.S. Patent No. 7,990,842	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1001 Public? Yes
	Online	07/18/2019		Wells Declaration	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1003 Public? Yes
	Online	07/18/2019		U.S. Patent No. 7,453,793	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1004 Public? Yes

	Availability	Date	#	Proceeding Text	Details
	Online	07/18/2019		U.S. Pub. No. 2005-0286474	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1006 Public? Yes
	Online	07/18/2019		Defendants' Joint Opening Claim Construction Brief	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1012 Public? Yes
	Online	07/18/2019		Munford Declaration	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1015 Public? Yes
	Online	07/18/2019		Defendants' Memo ISO Defendants' Joint MSJ on Indefiniteness	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1014 Public? Yes
	Online	07/18/2019		Defendants' Joint Responsive Claim Construction Brief	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1016 Public? Yes
	Online	07/18/2019		Plaintiff's Opposition to Defendants' Claim Construction Brief	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1017 Public? Yes
	Online	07/18/2019		Plaintiff's Opposition to Defendants' Joint MSJ	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1018 Public? Yes

	Availability	Date	#	Proceeding Text	Details
	Online	07/18/2019		Comparison of Huawei 842 and Current 842 Petition	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1019 Public? Yes
	Online	08/08/2019		Patent Owner's Mandatory Notices	Filed By: patentowner Document Type: PAPER Paper/Exhibit No: 4 Public? Yes
	Online	08/08/2019		Power of Attorney	Filed By: patentowner Document Type: PAPER Paper/Exhibit No: 5 Public? Yes
	Online	08/21/2019		Notice of Accord Filing Date	Filed By: board Document Type: PAPER Paper/Exhibit No: 6 Public? Yes
	Online	09/03/2019		Petitioners' Updated Exhibit List	Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 7 Public? Yes
	Online	09/03/2019		Order on MSJ, Claim Construction Order	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1020 Public? Yes
	Online	10/25/2019		Joint Motion to Terminate	Filed By: patentowner Document Type: PAPER Paper/Exhibit No: 8 Public? Yes

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	Availability	Date	#	Proceeding Text	Details
	Online	10/25/2019		Joint Request to Keep Separate	Filed By: patentowner Document Type: PAPER Paper/Exhibit No: 9 Public? Yes
	Online	12/11/2019		Termination Decision Document	Filed By: board Document Type: PAPER Paper/Exhibit No: 10 Public? Yes
	Online	01/06/2020		Petitioners' Request for Refund	Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 11 Public? Yes
	Online	01/24/2020		Notice of Refund	Filed By: board Document Type: PAPER Paper/Exhibit No: 12 Public? Yes

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Document: IPR2019-01437, ZTE Corporation Vs. Bell Northern Research, LLC, which is ... Actions

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IPR2019-01437, ZTE Corporation Vs. Bell Northern Research, LLC, which is a wholly owned subsidiary of Hilco Patent Acquisition 56, LLC, which is owned by both Hilco IP Merchant Capital, LLC, and Hilco, Inc.

US Patent Trial and Appeals Board - Alexandria

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This case was retrieved on 02/13/2020

Header

Case Number: IPR2019-01437
Date Filed: 08/05/2019
Date Full Case Retrieved: 02/13/2020
Status: Closed
Misc: (0) Unknown; Civil

Summary

Court Case Status: Terminated
Case Type: IPR: Inter partes review
Technical Center Number: 2400
Patent Application Number: 12684650
Patent Number: 7990842

Participants

Litigants	Attorneys
ZTE Corporation **Petitioner**	
Bell Northern Research, LLC, which is a wholly owned subsidiary of Hilco Patent Acquisition 56, LLC, which is owned by both Hilco IP Merchant Capital, LLC, and Hilco, Inc. **PatentOwner**	

Proceedings

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	Availability	Date	#	Proceeding Text	Details

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	Availability	Date	#	Proceeding Text	Details
	Online	08/05/2019		ZTE's Power of Attorney	Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 1 Public? Yes
	Online	08/05/2019		Coolpad's Power of Attorney	Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 2 Public? Yes
	Online	08/05/2019		U.S. Patent No. 7,990,842 (Trachewsky et al.) (the '842 patent)	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1101 Public? Yes
	Online	08/05/2019		U.S. Provisional Patent Application No. 60/634,102	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1104 Public? Yes
	Online	08/05/2019		Prosecution History of the '842 patent	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1102 Public? Yes
	Online	08/05/2019		U.S. Provisional Patent Application No. 60/591,104	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1103 Public? Yes
	Online	08/05/2019		U.S. Patent No. 7,646,703 (Trachewsky et al.)	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1105 Public? Yes

	Availability	Date	#	Proceeding Text	Details
	Online	08/05/2019		Prosecution History U.S. Patent No. 7,646,703	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1106 Public? Yes
	Online	08/05/2019		IEEE Std 802.11a-1999	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1107 Public? Yes
	Online	08/05/2019		Defendants' Joint Opening Claim Construction Brief (part 1)	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1112 Public? Yes
	Online	08/05/2019		Defendants' Joint Responsive Claim Construction Brief	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1116 Public? Yes
	Online	08/05/2019		Declaration of Jacob Robert Munford	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1109 Public? Yes
	Online	08/05/2019		BNR Disclosure of Asserted Claims and Infringement Contentions	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1110 Public? Yes
	Online	08/05/2019		Defendants' Invalidity Contentions	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1111 Public? Yes

	Availability	Date	#	Proceeding Text	Details
	Online	08/05/2019		Defendants' Joint Opening Claim Construction Brief (part 2)	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1112 Public? Yes
	Online	08/05/2019		Defendants' Joint Opening Claim Construction Brief (part 3)	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1112 Public? Yes
	Online	08/05/2019		Plaintiff's Opening Claim Construction Brief (part 1)	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1113 Public? Yes
	Online	08/05/2019		Plaintiff's Opening Claim Construction Brief (part 2)	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1113 Public? Yes
	Online	08/05/2019		Defendants' Memorandum iso Joint Motion for Summary Judgment	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1114 Public? Yes
	Online	08/05/2019		Supplemental Joint Claim Construction Hearing Statement	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1115 Public? Yes
	Online	08/05/2019		Plaintiff's Responsive Claim Construction Brief	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1117 Public? Yes

	Availability	Date	#	Proceeding Text	Details
	Online	08/05/2019		Plaintiff's Opposition to Defendants' Joint Motion for Summary Judgment	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1118 Public? Yes
	Online	08/05/2019		U.S. Patent Application Publication No. 2004/0093545	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1119 Public? Yes
	Online	08/05/2019		U.S. Provisional Application No. 60/314,168	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1120 Public? Yes
	Online	08/05/2019		U.S. Provisional Application No. 60/314,169	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1121 Public? Yes
	Online	08/05/2019		U.S. Patent No. 7,315,185 to Khandani	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1122 Public? Yes
	Online	08/05/2019		U.S. Patent No. 7,453,793 to Jones	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1123 Public? Yes
	Online	08/05/2019		Interest for HDR extension to 802.11a	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1127 Public? Yes

	Availability	Date	#	Proceeding Text	Details
	Online	08/05/2019		The Effect of the Number of Subcarriers in OFDM	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1141 Public? Yes
	Online	08/05/2019		OFDM for a Wideband Frequency Hopping PHY	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1142 Public? Yes
	Online	08/05/2019		Overview of OFDM for 802.11g	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1143 Public? Yes
	Online	08/05/2019		BNR Notice of Subpoena to Broadcom	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1151 Public? Yes
	Online	08/05/2019		U.S. Pub. No. 2005/0286474 to van Zelst	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1124 Public? Yes
	Online	08/05/2019		U.S. Pub. No. 2007/0060073 to Boer et al.	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1125 Public? Yes
	Online	08/05/2019		IEEE 802.11-1999	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1126 Public? Yes

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	Availability	Date	#	Proceeding Text	Details
	Online	08/05/2019		Introduction to Communications Engineering	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1128 Public? Yes
	Online	08/05/2019		Air Interface Considerations for Wireless LANS	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1129 Public? Yes
	Online	08/05/2019		Tutorial: Implementation Issues for Wireless Spread Spectrum Data Communications Links for use in License Free Applications	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1130 Public? Yes
	Online	08/05/2019		Continuous and Discrete Signals and Systems	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1131 Public? Yes
	Online	08/05/2019		Binary Data Transmission Techniques for Linear Systems	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1132 Public? Yes
	Online	08/05/2019		A Predicted Wave-Signalling Phase-Shift Telegraph System	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1133 Public? Yes
	Online	08/05/2019		Synthesis of Band-Limited Orthogonal Signals for Multichannel Data Transmission	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1134 Public? Yes

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	Availability	Date	#	Proceeding Text	Details
	Online	08/05/2019		Performance of an Efficient Parallel Data Transmission System	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1135 Public? Yes
	Online	08/05/2019		A Theoretical Study of Performance of an Orthogonal Multiplexing Data Transmission Scheme	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1136 Public? Yes
	Online	08/05/2019		Data Transmission by Frequency-Division Multiplexing Using the Discrete Fourier Transform	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1137 Public? Yes
	Online	08/05/2019		U.S. Patent No. 6,654,339 to Bohnke et al.	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1138 Public? Yes
	Online	08/05/2019		Scaleable OFDM Radio Parameters	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1139 Public? Yes
	Online	08/05/2019		OFDM for High Speed Wireless Networks	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1140 Public? Yes
	Online	08/05/2019		International Patent Application Publication WO 02/39598 to Crawford	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1144 Public? Yes

	Availability	Date	#	Proceeding Text	Details
	Online	08/05/2019		Digital Audio Broadcasting: radio now and for the future	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1145 Public? Yes
	Online	08/05/2019		Asymmetric Digital Subscriber Line	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1146 Public? Yes
	Online	08/05/2019		IEEE Std 802.11n-2009	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1147 Public? Yes
	Online	08/05/2019		IEEE Std 802.11ac-2013	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1148 Public? Yes
	Online	08/05/2019		The First IEEE Workshop on Wireless LANS: Preface	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1149 Public? Yes
	Online	08/05/2019		BNR Disclosure of Asserted Claims to ZTE	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1150 Public? Yes
	Online	08/05/2019		Proposal for an Improved long training symbol phase	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1152 Public? Yes

	Availability	Date	#	Proceeding Text	Details
	Online	08/05/2019		Declaration of Dr. Paul Min	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1108 Public? Yes
	Online	08/05/2019		Petition for Inter Partes Review of U.S. Patent 7,990,842	Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 3 Public? Yes
	Online	08/06/2019		Patent Owner's Mandatory Notices	Filed By: patentowner Document Type: PAPER Paper/Exhibit No: 4 Public? Yes
	Online	08/08/2019		Patent Owner's Power of Attorney	Filed By: patentowner Document Type: PAPER Paper/Exhibit No: 5 Public? Yes
	Online	08/22/2019		Notice of Accord Filing Date	Filed By: board Document Type: PAPER Paper/Exhibit No: 6 Public? Yes
	Online	09/03/2019		Petitioners' Updated Exhibit List	Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 7 Public? Yes
	Online	09/03/2019		Order on MSJ, Claim Construction Order	Filed By: petitioner Document Type: EXHIBITS Paper/Exhibit No: 1153 Public? Yes

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	Availability	Date	#	Proceeding Text	Details
	Online	10/25/2019		Joint Motion to Terminate	Filed By: patentowner Document Type: PAPER Paper/Exhibit No: 8 Public? Yes
	Online	10/25/2019		Joint Request to Keep Separate	Filed By: patentowner Document Type: PAPER Paper/Exhibit No: 9 Public? Yes
	Online	12/11/2019		Decision - Settlement Prior to Institution of Trial	Filed By: board Document Type: PAPER Paper/Exhibit No: 10 Public? Yes
	Online	01/06/2020		Petitioners' Request for Refund	Filed By: petitioner Document Type: PAPER Paper/Exhibit No: 11 Public? Yes
	Online	01/30/2020		Notice of Refund	Filed By: board Document Type: PAPER Paper/Exhibit No: 12 Public? Yes

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US District Court Docket

US District Court for the Southern District of California

(San Diego)

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Header

Case Number: 3:18cv1784
Date Filed: 08/01/2018
Assigned To: Judge Cathy Ann Bencivengo
Referred To: Magistrate Judge Barbara Lynn Major
Nature of Suit: Patent (830)
Cause: Patent Infringement
Lead Docket: None
Other Docket: None
Jurisdiction: Federal Question

Class Code: Closed
Closed: 12/03/2019
Statute: 35:0271
Jury Demand: Defendant
Demand Amount: $0
NOS Description: Patent

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Proceedings

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	Availability	#	Date	Proceeding Text	Source
	Free	1	08/01/2018	COMPLAINT with Jury Demand against Huawei Device (Hong Kong) Co., Ltd., Huawei Device USA, Inc., Huawei Technologies Co., Ltd. (Filing fee $ 400 receipt number 0974-11515119.), filed by Bell Northern Research, LLC. (Attachments: # 1 Civil Cover Sheet, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E, # 7 Exhibit F, # 8 Exhibit G)The new case number is 3:18-cv-1784-MMA-JLB. Judge Michael M. Anello and Magistrate Judge Jill L. Burkhardt are assigned to the case. (Malmberg, Mieke)(tcf) (dsn) (Entered: 08/02/2018)	
	Free	2	08/02/2018	REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,319,889*, *8,204,554*, ***7,990,842***, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (tcf) (dsn) (Entered: 08/02/2018)	
	Free	3	08/02/2018	Summons Issued. Counsel receiving this notice electronically should print this summons and serve it in accordance with Rule 4, Fed.R.Civ.P and LR 4.1. (tcf) (dsn) (Entered: 08/02/2018)	
	Pointer	4	08/02/2018	MINUTE ORDER. Judge Michael M. Anello has declined assignment pursuant to General Order 598. Case reassigned to Judge Dana M. Sabraw for all further proceedings. The new case number is 18cv1784 DMS (JLB).(no document attached) (jcj) (Entered: 08/02/2018)	

	Availability	#	Date	Proceeding Text	Source
	Free	5	08/02/2018	NOTICE of Party With Financial Interest by Bell Northern Research, LLC . Identifying Corporate Parent Hilco Patent Acquisition 56, LLC, Corporate Parent Hilco IP Merchant Capital, LLC, Corporate Parent Hilco, Inc. for Bell Northern Research, LLC. (Malmberg, Mieke) (jpp). (jao). (Entered: 08/02/2018)	
	Free	6	08/02/2018	NOTICE of Appearance by Mieke Katherine Malmberg on behalf of Bell Northern Research, LLC (Malmberg, Mieke) (jpp). (Entered: 08/02/2018)	
	Free	7	08/06/2018	NOTICE OF RELATED CASE(S) by Bell Northern Research, LLC of case(s) 3:18-cv-1783, 3:18-cv-1785, 3:18-cv-1786 . (Malmberg, Mieke) (aef). (Entered: 08/06/2018)	
	Free	8	08/09/2018	SUMMONS Returned Executed by Bell Northern Research, LLC. Huawei Device USA, Inc. served. (Malmberg, Mieke) (aef). (Entered: 08/09/2018)	
	Free	9	08/21/2018	ORDER OF TRANSFER PURSUANT TO LOW NUMBER RULE. Case reassigned to Judge Cathy Ann Bencivengo and Magistrate Judge Barbara Lynn Major for all further proceedings. Judge Dana M. Sabraw and Magistrate Judge Jill L. Burkhardt no longer assigned to case. Create association to 3:18-cv-01783-CAB-BLM. The new case number is 18cv1784-CAB-BLM. Signed by Judge Cathy Ann Bencivengo on 8/16/2018. Signed by Judge Dana M. Sabraw on 8/17/2018.(aef) (Entered: 08/22/2018)	
	Free	10	08/23/2018	MOTION for Extension of Time to File Answer by Bell Northern Research, LLC. (Malmberg, Mieke) (anh). (Entered: 08/23/2018)	
	Free	11	08/23/2018	ORDER Granting Motion for Extension of Time for Huawei Device USA, Inc. to Respond to Plaintiff's Complaint [Doc. No. 10]. Signed by Judge Cathy Ann Bencivengo on 8/23/2018. (anh) (Entered: 08/23/2018)	
	Free	12	09/20/2018	MOTION for Leave to File Unopposed Motion for Leave to Amend Complaint by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A, # 2 Declaration B, # 3 Exhibit C)(Malmberg, Mieke) (anh). (Entered: 09/20/2018)	
	Free	13	09/21/2018	NOTICE of Appearance by Jason W Wolff on behalf of Huawei Device USA, Inc. (Wolff, Jason)Attorney Jason W Wolff added to party Huawei Device USA, Inc.(pty:dft) (aef). (Entered: 09/21/2018)	
	Free	14	09/21/2018	ORDER granting Plaintiff's Unopposed Motion for Leave to Amend Complaint [Doc. No. 12]. Signed by Judge Cathy Ann Bencivengo on 9/21/2018. (anh) (Entered: 09/21/2018)	
	Free	15	09/21/2018	FIRST AMENDED COMPLAINT with Jury Demand against Huawei Device USA, Inc., Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., filed by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Exhibit F, # 7 Exhibit G) (Malmberg, Mieke) (aef). (Entered: 09/21/2018)	

	Availability	#	Date	Proceeding Text	Source
	Free	16	09/24/2018	Minute Order: It is hereby ORDERED that a case management conference in the above-referenced cases will take place on October 22, 2018 at 2.30 p.m. before Judge Bencivengo in Courtroom 4C.(aef) (Entered: 09/24/2018)	
	Free	17	09/25/2018	WAIVER OF SERVICE Returned Executed by Huawei Device USA, Inc., as to Huawei Device (Dongguan) Co., Ltd.. (Wolff, Jason) (anh). (Entered: 09/25/2018)	
	Free	18	09/25/2018	WAIVER OF SERVICE Returned Executed by Huawei Device USA, Inc., as to Huawei Device (Shenzhen) Co., Ltd.. (Wolff, Jason) (anh). (Entered: 09/25/2018)	
	Free	19	09/25/2018	MOTION for Extension of Time to File Answer re 15 Amended Complaint, by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc.. (Attachments: # 1 Exhibit 1- Stipulation)(Wolff, Jason)Attorney Jason W Wolff added to party Huawei Device (Dongguan) Co., Ltd.(pty:dft), Attorney Jason W Wolff added to party Huawei Device (Shenzhen) Co., Ltd. (pty:dft) (anh). (Entered: 09/25/2018)	
	Free	20	09/26/2018	ORDER Granting Unopposed Motion for Extension of Time to Respond to Plaintiff's Amended Complaint. Signed by Judge Cathy Ann Bencivengo on 9/26/2018. (anh) (Entered: 09/26/2018)	
	Free	21	09/28/2018	NOTICE of Appearance by Robert M. Yeh on behalf of Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc. (Yeh, Robert)Attorney Robert M. Yeh added to party Huawei Device (Dongguan) Co., Ltd.(pty:dft), Attorney Robert M. Yeh added to party Huawei Device (Shenzhen) Co., Ltd. (pty:dft), Attorney Robert M. Yeh added to party Huawei Device USA, Inc.(pty:dft) (anh). (Entered: 09/28/2018)	
	Free	22	10/04/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11755996.)(Application to be reviewed by Clerk.)(Skiermont, Paul)(jrd) (Entered: 10/04/2018)	
	Free	23	10/04/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11756048.)(Application to be reviewed by Clerk.)(Abdullah, Sadaf)(jrd) (Entered: 10/04/2018)	
	Free	24	10/04/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11756088.)(Application to be reviewed by Clerk.)(Hartsell, Steven)(jrd) (Entered: 10/04/2018)	
	Free	25	10/09/2018	ORDER Approving the Pro Hac Vice Application of Paul J. Skiermont, re 22 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 10/5/2018. (mdc) (Entered: 10/09/2018)	
	Free	26	10/09/2018	ORDER Approving the Pro Hac Vice Application of Sadaf R. Abdullah, re 23 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 10/5/2018. (mdc) (Entered: 10/09/2018)	
	Free	27	10/09/2018	ORDER Approving the Pro Hac Vice Application of Steven W. Hartsell, re 24 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 10/5/2018. (mdc) (Entered: 10/09/2018)	

	Availability	#	Date	Proceeding Text	Source
	Free	28	10/15/2018	REPORT of Rule 26(f) Planning Meeting. (Abdullah, Sadaf) (anh). (Entered: 10/15/2018)	
	Runner	29	10/22/2018	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Case Management Conference held on 10/22/2018.(Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf R. Abdullah and Mieke K. Malmberg). (Defendant Attorney Jason Wolff and Robert Yeh). (no document attached) (imh) (Entered: 10/22/2018)	
	Free	30	10/23/2018	Case Management Order Regulating Discovery and Other Pretrial Proceedings in a **Patent** Case. Signed by Magistrate Judge Barbara Lynn Major on 10/23/2018. (anh) (Entered: 10/23/2018)	
	Free	31	10/31/2018	Huawei Defendants' ANSWER to 15 Amended Complaint, by Huawei Device USA, Inc., Huawei Device (Shenzhen) Co., Ltd., Huawei Device (Dongguan) Co., Ltd..(Fuller, Joanna)Attorney Joanna M. Fuller added to party Huawei Device (Dongguan) Co., Ltd.(pty:dft), Attorney Joanna M. Fuller added to party Huawei Device (Shenzhen) Co., Ltd. (pty:dft), Attorney Joanna M. Fuller added to party Huawei Device USA, Inc.(pty:dft) (anh). (Entered: 10/31/2018)	
	Free	32	10/31/2018	NOTICE of Party With Financial Interest by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc. . Identifying Corporate Parent Huawei Technologies Co., Ltd., Corporate Parent Huawei Investment & Holding Co., Ltd., Corporate Parent Huawei Tech. Investment Co., Ltd. for Huawei Device (Shenzhen) Co., Ltd.; Corporate Parent Huawei Device (Hong Kong) Co., Ltd. for Huawei Device USA, Inc.; Corporate Parent Huawei Device (Shenzhen) Co., Ltd. for Huawei Device (Dongguan) Co., Ltd.. (Fuller, Joanna) (anh). (jao). (Entered: 10/31/2018)	
	Free	33	11/13/2018	SECOND AMENDED COMPLAINT with Jury Demand against Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc., filed by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Exhibit F, # 7 Exhibit G, # 8 Exhibit H, # 9 Exhibit I) (Abdullah, Sadaf) (anh). (Entered: 11/13/2018)	
	Free	34	11/16/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11910677.) (Application to be reviewed by Clerk.) (Hodge, Christopher) (mdc) (Entered: 11/16/2018)	
	Free	35	11/20/2018	ORDER Approving the Pro Hac Vice Application of Christopher M. Hodge (Re: Doc. No. 34 Request to Appear Pro Hac Vice). Signed by Judge Cathy Ann Bencivengo on 11/19/2018.(jrd) (Entered: 11/20/2018)	
	Free	36	11/28/2018	ANSWER to 33 Amended Complaint, by Huawei Device USA, Inc., Huawei Device (Shenzhen) Co., Ltd., Huawei Device (Dongguan) Co., Ltd..(Fuller, Joanna) (anh). (Entered: 11/28/2018)	

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	Availability	#	Date	Proceeding Text	Source
	Free	37	11/30/2018	Joint MOTION for Protective Order , Joint MOTION for Production of Electronically Stored Information (ESI) by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A - Proposed Protective Order, # 2 Exhibit B - Proposed Order Governing Discovery of Electronically Stored Information)(Abdullah, Sadaf) QC Email: Proposed Order (anh). (Entered: 11/30/2018)	
	Free	38	12/05/2018	ORDER Granting 37 Joint Motion for Entry of Protective Order and ESI Order with Modifications. Signed by Magistrate Judge Barbara Lynn Major on 12/5/2018. (rmc) (Entered: 12/05/2018)	
	Free	39	01/02/2019	NOTICE OF RELATED CASE(S) by Bell Northern Research, LLC of case(s) 3:18-cv-2864 . (Malmberg, Mieke) (anh). (Entered: 01/02/2019)	
	Free	40	02/05/2019	MOTION to Clarify Case Management Order (Unopposed), MOTION to Consolidate Cases (Unopposed) by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered: 02/05/2019)	
	Free	41	02/08/2019	ORDER Granting Unopposed Motion for Clarification of the CMO and Consolidation for Pre-Trial [Doc. No. 40].. Signed by Judge Cathy Ann Bencivengo on 2/8/2019. (anh) (Entered: 02/11/2019)	
	Free	42	02/27/2019	NOTICE of Motion to Withdraw as Counsel of Record of Robert M. Yeh by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc. (Fuller, Joanna) (anh). (Entered: 02/27/2019)	
	Free	43	02/27/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12247872.)(Application to be reviewed by Clerk.)(Rubin, Ethan)(jrd) (Entered: 02/27/2019)	
	Runner	44	02/27/2019	PRO HAC APPROVED: Ethan J. Rubin appearing for Defendants: Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc. (no document attached) (jrd) (Entered: 02/27/2019)	
	Free	45	02/27/2019	NOTICE of Appearance by Michael Sobolev on behalf of Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc. (Sobolev, Michael)Attorney Michael Sobolev added to party Huawei Device (Dongguan) Co., Ltd.(pty:dft), Attorney Michael Sobolev added to party Huawei Device (Shenzhen) Co., Ltd.(pty:dft), Attorney Michael Sobolev added to party Huawei Device USA, Inc.(pty:dft) (anh). (Entered: 02/27/2019)	
	Free	46	03/08/2019	**Withdrawn per doc. 56 ** MOTION to Strike Affirmative Defenses by Bell Northern Research, LLC. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of Sadaf Abdullah, # 3 Exhibit List, # 4 Exhibit 1, # 5 Exhibit 2, # 6 Exhibit 3, # 7 Exhibit 4, # 8 Exhibit 5, # 9 Exhibit 6, # 10 Exhibit 7)(Abdullah, Sadaf) (anh). (Entered: 03/08/2019)	
	Free	47	03/28/2019	MOTION to File Documents Under Seal (Hodge, Christopher) (rmc). (Entered: 03/28/2019)	

	Availability	#	Date	Proceeding Text	Source
	Free	48	03/28/2019	ORDER Granting 47 Plaintiff's Motion for an Order Permitting Defendants to File an Unredacted Version of Their Opposition to Plaintiff's Motion to Strike Under Seal. Signed by Judge Cathy Ann Bencivengo on 3/28/2019. (rmc) (Entered: 03/28/2019)	
	Free	49	03/29/2019	RESPONSE in Opposition re 46 MOTION to Strike Affirmative Defenses filed by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc.. (Attachments: # 1 Declaration of Joanna M. Fuller, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D)(Fuller, Joanna) (dlg). (Entered: 03/29/2019)	
	Online	50	03/29/2019	*** DOCKETED SEALED ON 3/29/19, ECF 51 *** SEALED LODGED Proposed Document re: 47 MOTION to File Documents Under Seal. Document to be filed by Clerk if Motion to Seal is granted. (Fuller, Joanna) (dlg). Modified on 4/1/2019 (dlg). (Entered: 03/29/2019)	
	Free	52	04/05/2019	REPLY to Response to Motion re 46 MOTION to Strike Affirmative Defenses filed by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered. 04/05/2019)	
	Free	53	04/10/2019	MINUTE ORDER: It is hereby ORDERED that a hearing on Plaintiffs motion to strike affirmative defenses [Doc. No. 46] is set for April 22, 2019 at 2:30 p.m. in Courtroom 4C.(anh) (Entered: 04/10/2019)	
	Free	54	04/12/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12400185.) (Application to be reviewed by Clerk) (Gasser, Alexander) (mdc) (Entered: 04/12/2019)	
	Free	55	04/15/2019	ORDER Approving the Pro Hac Vice Application of Alexander E. Gasser, re 54 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 4/15/2019.(dsn) (Entered. 04/16/2019)	
	Free	56	04/19/2019	NOTICE of Withdrawal by Bell Northern Research, LLC re 46 MOTION to Strike Affirmative Defenses (Abdullah, Sadaf) (anh). (Entered: 04/19/2019)	
	Free	57	04/19/2019	MINUTE ORDER: Pursuant to Bell Northerns notice withdrawing its motion to strike [Doc. No. 56], it is hereby ORDERED that the motion to strike [Doc. No. 46] is deemed WITHDRAWN, and the April 22, 2019 hearing is VACATED. It is further ORDERED that Defendants have leave to file the amended answers described in todays notice and do not need to file a separate motion for leave to amend. It is SO ORDERED.(anh) (Entered: 04/19/2019)	
	Free	58	04/19/2019	JOINT HEARING STATEMENT by Bell Northern Research, LLC. (Attachments: # 1 Appendix A - Joint Claim Construction Worksheet, # 2 Appendix B - Joint Claim Construction Chart)(Abdullah, Sadaf) (anh). (Entered: 04/19/2019)	

	Availability	#	Date	Proceeding Text	Source
	Free	59	04/25/2019	AMENDED ANSWER to - Huawei Defendants First Amended Answer to Plaintiff Bell Northern Research, LLCs Second Amended Complaint for **Patent** Infringement 33 Amended Complaint, by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc.. (Fuller, Joanna) (anh). (Entered: 04/25/2019)	
	Free	60	04/26/2019	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Status Hearing re Claim Construction held on 4/26/2019. Claim Construction Hearing confirmed for 6/19/2019 09:00 AM in Courtroom 4C before Judge Cathy Ann Bencivengo. (Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Abdullah and Steven Hartsell). (Defendant Attorney Joanna Fuller and Michael Sobolev). (no document attached) (imh) (Entered: 04/29/2019)	
	Free	61	05/06/2019	NOTICE OF FILING OF OFFICIAL TRANSCRIPT of Proceedings held on 4/26/2019 before Judge Cathy Ann Bencivengo. Court Reporter/Transcriber: Mauralee Ramirez. Transcript may be viewed at the court public terminal or purchased through the Court Reporter/Transcriber before the deadline for Release of Transcript Restriction. After that date it may be obtained through PACER or the Court Reporter/Transcriber. If redaction is necessary, parties have seven calendar days from the file date of the Transcript to E-File the Notice of Intent to Request Redaction. The following deadlines would also apply if requesting redaction: Redaction Request Statement due to Court Reporter/Transcriber 5/28/2019. Redacted Transcript Deadline set for 6/6/2019. Release of Transcript Restriction set for 8/5/2019. (Transcript filed in case numbers 3:18-cv-01783-CAB-BLM, 3:18-cv-01784-CAB-BLM, 3:18-cv-01785-CAB-BLM,3:18-cv-01786-CAB-BLM, and 3:18-cv-02864-CAB-BLM.) (akr) (Entered: 05/06/2019)	
	Free	62	05/13/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12504861) (Application to be reviewed by Clerk.) (Udick, Steven) (mdc) (Entered: 05/13/2019)	
	Free	63	05/17/2019	ORDER Approving the Pro Hac Vice Application of Steven J. Udick, re 62 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 5/16/2019. (mdc) (Entered: 05/17/2019)	
	Free	64	05/24/2019	CLAIM CONSTRUCTION BRIEF by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc.. (Attachments: # 1 Declaration of Joanna M. Fuller, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E, # 7 Exhibit F, # 8 Exhibit G, # 9 Exhibit H, # 10 Exhibit I, # 11 Exhibit J, # 12 Exhibit K, # 13 Exhibit L)(Fuller, Joanna) (anh). (Entered: 05/24/2019)	

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	Availability	#	Date	Proceeding Text	Source
	Free	65	05/24/2019	Joint MOTION for Summary Judgment on Indefiniteness by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc.. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of Amol A. Parikh, # 3 Exhibit A, # 4 Exhibit B, # 5 Exhibit C, # 6 Exhibit D, # 7 Exhibit E, # 8 Exhibit F, # 9 Exhibit G, # 10 Exhibit H)(Fuller, Joanna) (anh). (Entered: 05/24/2019)	
	Free	66	05/24/2019	CLAIM CONSTRUCTION BRIEF by Bell Northern Research, LLC. (Attachments: # 1 Declaration of S. Abdullah, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E, # 7 Exhibit F, # 8 Exhibit G, # 9 Exhibit H, # 10 Exhibit I, # 11 Exhibit J, # 12 Exhibit K, # 13 Exhibit L, # 14 Exhibit M, # 15 Exhibit N, # 16 Exhibit O, # 17 Exhibit P, # 18 Exhibit Q, # 19 Exhibit R, # 20 Exhibit S, # 21 Exhibit T, # 22 Exhibit U, # 23 Exhibit V, # 24 Exhibit W)(Abdullah, Sadaf) (anh). (Entered: 05/24/2019)	
	Free	67	05/24/2019	DECLARATION re 64 Claim Construction Brief, [Corrected Declaration of Joanna M. Fuller In Support of Defendants' Opening Claim Construction Brief] by Defendants Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc.. (Attachments: # 1 Exhibit A, Part 1, # 2 Exhibit A, Part 2, # 3 Exhibit A, Part 3, # 4 Exhibit B, # 5 Exhibit C, Part 1, # 6 Exhibit C, Part 2, # 7 Exhibit D, # 8 Exhibit E, # 9 Exhibit F, # 10 Exhibit G, # 11 Exhibit H, # 12 Exhibit I, # 13 Exhibit J, # 14 Exhibit K, # 15 Exhibit L)(Fuller, Joanna) (anh). (Entered: 05/24/2019)	
	Free	68	06/12/2019	SUPPLEMENTAL DOCUMENT by Bell Northern Research, LLC re 58 Joint Hearing Statement Supplemental Joint Hearing Statement. (Hartsell, Steven) (anh). (Entered: 06/12/2019)	
	Online	69	06/14/2019	NOTICE Of Filing Of Petitions For Inter Partes Review by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc. (Fuller, Joanna) (anh). (Entered: 06/14/2019)	
	Free	70	06/14/2019	RESPONSE TO CLAIM CONSTRUCTION BRIEF by Huawei Device (Dongguan) Co., Ltd.. (Attachments: # 1 Declaration of James Young Hurt, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D)(Fuller, Joanna) (anh). (Entered: 06/14/2019)	
	Free	71	06/14/2019	RESPONSE TO CLAIM CONSTRUCTION BRIEF by Bell Northern Research, LLC. (Attachments: # 1 Declaration of S. Abdullah, # 2 Exhibit X, # 3 Exhibit Y, # 4 Exhibit Z, # 5 Exhibit AA)(Abdullah, Sadaf) (anh). (Entered: 06/14/2019)	
	Free	72	06/14/2019	RESPONSE in Opposition re 65 Joint MOTION for Summary Judgment on Indefiniteness filed by Bell Northern Research, LLC. (Attachments: # 1 Declaration of S. Abdullah, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4, # 6 Exhibit 5)(Abdullah, Sadaf) (anh). (Entered: 06/14/2019)	

	Availability	#	Date	Proceeding Text	Source
	Free	73	06/17/2019	MOTION to Allow the Use of Electrical Equipment in the Courtroom during Hearing Scheduled for June 19-20, 2019 by Bell Northern Research, LLC. (Hartsell, Steven) (anh). (Entered: 06/17/2019)	
	Online	74	06/18/2019	ORDER Granting Defendants' Joint Motion for Order Authorizing Use of Electronic Equipment in Courtroom for Claim Construction Hearing June 19-20, 2019. Signed by Judge Cathy Ann Bencivengo on 6/18/2019. (anh) (Entered: 06/18/2019)	
	Runner	75	06/19/2019	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Claims Construction Hearing held on 6/19/2019 and continued to 6/20/2019 09:00 AM in Courtroom 4C before Judge Cathy Ann Bencivengo. (Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Raja Abdullah, Steven Harsell and Paul Skiermont). (Defendant Attorney Joanna Fuller Ethan Rubin and Jason Wolff). (no document attached) (lmh) (Entered: 06/20/2019)	
	Runner	76	06/20/2019	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Claims Construction Hearing held and completed on 6/20/2019. Court to issue written Claims Construction Order.(Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Raja Abdullah, Steven Hartsell and Paul Skiermont). (Defendant Attorney Joanna Fuller, Ethan Rubin and Jason Wolff). (no document attached) (lmh) (Entered: 06/21/2019)	
	Online	77	06/25/2019	ORDER Setting Briefing Schedule for Motions to Compel. Signed by Magistrate Judge Barbara Lynn Major on 6/25/2019.(anh) (Entered: 06/25/2019)	
	Free	78	07/08/2019	MOTION to Compel Responses to Interrogatories and Production of Documents by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc.. (Attachments: # 1 Memo of Points and Authorities (REDACTED), # 2 Declaration Ethan J. Rubin, # 3 Exhibit A, # 4 Exhibit B, # 5 Exhibit C (REDACTED), # 6 Exhibit D, # 7 Exhibit E, # 8 Exhibit F, # 9 Exhibit G, # 10 Exhibit H, # 11 Exhibit I, # 12 Exhibit J)(Sobolev, Michael) (anh). (Entered: 07/08/2019)	
	Online	79	07/08/2019	MOTION to File Documents Under Seal (Sobolev, Michael) (rmc). (Entered: 07/08/2019)	
	Online	80	07/08/2019	** Filed as Sealed Document 100 on 8/29/2019 ** SEALED LODGED Proposed Document re: 79 MOTION to File Documents Under Seal. Document to be filed by Clerk if Motion to Seal is granted. (With attachments) (Sobolev, Michael) (rmc). (Main Document 80 replaced on 8/29/2019) (rmc). Modified on 8/29/2019 to add file date of lodgment (rmc). (Entered: 07/08/2019)	
	Free	81	07/08/2019	MOTION to Compel Huawei's Response to Plaintiff's Common Interrogatory No. 10 by Bell Northern Research, LLC. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of S. Abdullah, # 3 Exhibit A, # 4 Exhibit B, # 5 Exhibit C, # 6 Exhibit D, # 7 Exhibit E, # 8 Exhibit F, # 9 Exhibit G, # 10 Exhibit H, # 11 Exhibit I, # 12 Exhibit J, # 13 Exhibit K, # 14 Exhibit L, # 15 Exhibit M)(Abdullah, Sadaf) (anh). (Entered: 07/08/2019)	

	Availability	#	Date	Proceeding Text	Source
	Free	82	07/10/2019		
	Free	83	07/11/2019	Ex Parte MOTION to Strike 82 MOTION to Stay Case Pending Inter Partes Review [Defendants' Unopposed Ex Parte Application for an Order to Strike Filing by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc.. (Attachments: # 1 Declaration of Michael Sobolev)(Sobolev, Michael) (anh). (Entered: 07/11/2019)	
	Free	84	07/11/2019		
	Online	85	07/15/2019	RESPONSE in Opposition re 81 MOTION to Compel Huawei's Response to Plaintiff's Common Interrogatory No. 10 filed by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc.. (Attachments: # 1 Declaration of Joanna M. Fuller, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4, # 6 Exhibit 5, # 7 Exhibit 6, # 8 Exhibit 7, # 9 Exhibit 8, # 10 Exhibit 9, # 11 Exhibit 10, # 12 Exhibit 11, # 13 Exhibit 12, # 14 Exhibit 13, # 15 Exhibit 14, # 16 Exhibit 15)(Sobolev, Michael) (lrm). (Entered: 07/15/2019)	
	Online	86	07/15/2019	RESPONSE in Opposition re 78 MOTION to Compel Responses to Interrogatories and Production of Documents filed by Bell Northern Research, LLC. (Attachments. # 1 Declaration of A. Dean, # 2 Declaration S. Abdullah, # 3 Exhibit 1, # 4 Exhibit 2, # 5 Exhibit 3, # 6 Exhibit 4, # 7 Exhibit 5)(Abdullah, Sadaf) (rmc). (Entered: 07/15/2019)	
	Online	87	07/15/2019	MOTION to File Documents Under Seal (Abdullah, Sadaf) (rmc). (Entered: 07/15/2019)	
	Online	88	07/15/2019	** Filed as Sealed Document 103 on 8/29/2019 ** SEALED LODGED Proposed Document re: 87 MOTION to File Documents Under Seal. Document to be filed by Clerk if Motion to Seal is granted. (With attachments) (Abdullah, Sadaf) (rmc). (Main Document 88 replaced on 8/29/2019) (rmc). Modified on 8/29/2019 to add file date of lodgment (rmc). (Entered: 07/15/2019)	
	Free	89	07/17/2019	MOTION to Stay Case Pending Inter Partes Review by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc.. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of Joanna M. Fuller, # 3 Exhibit A)(Fuller, Joanna) (anh). (Entered: 07/17/2019)	
	Online	90	07/22/2019	REPLY to Response to Motion re 78 MOTION to Compel Responses to Interrogatories and Production of Documents [Defendants' Reply In Support of Their Motion to Compel Responses to Interrogatories and Production of Documents] filed by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc.. (Fuller, Joanna) (anh). (Entered: 07/22/2019)	
	Online	91	07/22/2019	REPLY to Response to Motion re 81 MOTION to Compel Huawei's Response to Plaintiff's Common Interrogatory No. 10 filed by Bell Northern Research, LLC. (Attachments: # 1 Declaration of S. Abdullah, # 2 Exhibit N, # 3 Exhibit O, # 4 Exhibit P)(Abdullah, Sadaf) (anh). (Entered: 07/22/2019)	

	Availability	#	Date	Proceeding Text	Source
	Online	92	08/07/2019	NOTICE of Filing Petition for Inter Partes Review by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc. (Fuller, Joanna) (anh). (Entered: 08/07/2019)	
	Free	93	08/07/2019	RESPONSE in Opposition re 89 MOTION to Stay Case Pending Inter Partes Review filed by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Steven W. Hartsell, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4, # 6 Exhibit 5, # 7 Exhibit 6, # 8 Exhibit 7, # 9 Exhibit 8, # 10 Exhibit 9, # 11 Exhibit 10)(Hartsell, Steven) (anh). (Entered: 08/07/2019)	
	Free	94	08/09/2019	Claim Construction ORDER and ORDER on Motions for Summary Judgment [Doc. No. 65]. Signed by Judge Cathy Ann Bencivengo on 8/9/2019. (anh) (Entered: 08/09/2019)	
	Free	95	08/12/2019	ORDER on Request for Pre-Institution Stay of the Litigation [Doc. No. 89]. Signed by Judge Cathy Ann Bencivengo on 8/12/2019. (anh) (Entered: 08/12/2019)	
	Free	96	08/15/2019	ORDER Denying Plaintiff's Motion to Compel Defendants' Response to Common Interrogatory No. 10 [ECF Nos. 81 , 86 , 91]. Signed by Magistrate Judge Barbara Lynn Major on 8/15/2019. (anh) (Entered: 08/15/2019)	
	Free	97	08/21/2019	SCHEDULING ORDER Regulating Discovery and Other Pretrial Proceedings. Signed by Magistrate Judge Barbara Lynn Major on 08/21/2019.(mme) (Entered: 08/22/2019)	
	Free	98	08/26/2019	Joint MOTION to Amend/Correct 38 Order on Motion for Protective Order, Order on Motion for Production of Electronically Stored Information (ESI) by Bell Northern Research, LLC. (Attachments: # 1 Proposed Order) (Hartsell, Steven) (anh). (Entered: 08/26/2019)	
	Free	99	08/29/2019	ORDER Granting 79 Motion to File Under Seal. Based on the motion to file documents under seal [ECF No. 79] and good cause shown, the motion is granted, and it is hereby ordered that the following documents be filed under seal: 1. Huawei's unredacted Memorandum of Points and Authorities in support of its Motion to Compel; 2. Ex. C to Ethan J. Rubin Declaration, Supplemental Responses to Common Interrogatories, Set One. Signed by Magistrate Judge Barbara Lynn Major on 8/29/2019. (rmc) (Entered: 08/29/2019)	
	Free	101	08/29/2019	ORDER Denying Defendants' Motion to Compel Plaintiff's Responses to Written Discovery [ECF Nos. 78 , 86 , 90]. Signed by Magistrate Judge Barbara Lynn Major on 8/29/2019. (anh) (Entered: 08/29/2019)	
	Free	102	08/29/2019	ORDER Granting 87 Motion to File Under Seal. Based on the motion to file documents under seal [ECF No. 87] and good cause shown, the motion is granted, and it is hereby ordered that the following documents be filed under seal: Ex. 2, Confidential Third-Party PowerPoint Presentation Relating to Licensing Discussions; Ex. 3, Confidential Rule 408 Communications between BNR and Huawei; Ex. 4, Confidential Rule 409 Communications between BNR and Huawei. Signed by Magistrate Judge Barbara Lynn Major on 8/29/2019. (rmc) (Entered: 08/29/2019)	

	Availability	#	Date	Proceeding Text	Source
	Online	104	08/30/2019	ORDER Granting Joint Motion to Correct Protective Order [ECF No. 98]. Signed by Magistrate Judge Barbara Lynn Major on 8/30/2019. (anh) (Entered: 08/30/2019)	
	Free	105	09/05/2019	Joint MOTION for Protective Order [Motion for Stipulated Supplemental Protective Order] by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A)(Udick, Steven) (rmc). (Entered: 09/05/2019)	
	Free	106	09/06/2019	NOTICE of Appearance by Jaime Olin on behalf of Bell Northern Research, LLC (Olin, Jaime)Attorney Jaime Olin added to party Bell Northern Research, LLC(pty:pla) (anh). (Entered: 09/06/2019)	
	Free	107	09/09/2019	ORDER Granting Joint Motion for Entry of Protective Order Between Plaintiff, Defendants, and Non-Party Qualcomm Incorporated [ECF No. 105]. Signed by Magistrate Judge Barbara Lynn Major on 9/9/2019. (anh) (Entered: 09/09/2019)	
	Free	108	09/13/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12938486.)(Application to be reviewed by Clerk.)(Reger, Thomas)(jrd) (Entered: 09/13/2019)	
	Runner	109	09/13/2019	PRO HAC APPROVED: Thomas Howard Reger, II appearing for Defendants Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc. (no document attached) (jrd) (Entered: 09/13/2019)	
	Free	110	09/13/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12940459.) (Application to be reviewed by Clerk.) (Goter, Phillip) (mdc) (Entered: 09/13/2019)	
	Runner	111	09/16/2019	PRO HAC APPROVED re 110 : Phillip Wagner Goter appearing for Defendants Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc. (no document attached) (mdc) (Entered: 09/16/2019)	
	Free	112	09/20/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12966688.)(Application to be reviewed by Clerk.)(Ramirez, Joseph)(jrd) (Entered: 09/20/2019)	
	Free	113	09/23/2019	ORDER Approving the Pro Hac Vice Application of Joseph M. Ramirez, re 112 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 9/20/2019. (mdc) (Entered: 09/23/2019)	
	Free	114	09/24/2019	Joint MOTION Concerning The May 15, 2019 Executive Order With Regard To Huawei by Bell Northern Research, LLC. (Olin, Jaime) (anh). (Entered: 09/24/2019)	
	Free	115	09/25/2019	Joint MOTION to Take Deposition from Kyocera International, Inc. (Defendants Joint Unopposed Motion for Leave to Conduct the Deposition of Third Party Kyocera International, Inc. Out of Time) by Huawei Device (Dongguan) Co., Ltd., Huawei Device (Shenzhen) Co., Ltd., Huawei Device USA, Inc.. (Attachments: # 1 Defendants Joint Unopposed Motion for Leave to Conduct the Deposition of Third Party Kyocera International, Inc. Out of Time, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit) (Fuller, Joanna) (anh). (Entered: 09/25/2019)	

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	Availability	#	Date	Proceeding Text	Source
	Free	116	09/26/2019	ORDER on Joint Motion Concerning the May 15, 2019 Executive Order With Regard to Huawei [ECF No. 114]. Signed by Magistrate Judge Barbara Lynn Major on 9/26/2019. (anh) (Entered: 09/26/2019)	
	Free	117	09/30/2019	ORDER Granting Defendants" Joint Unopposed Motion for Leave to Conduct the Deposition of Third Party Kyocera International, inc Out of Time.. Signed by Magistrate Judge Barbara Lynn Major on 9/30/2019. (anh) (Entered: 09/30/2019)	
	Free	118	10/11/2019	MOTION to Withdraw as Attorney Christopher M. Hodge by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Steven W. Hartsell in Support)(Hartsell, Steven) (anh). (Entered: 10/11/2019)	
	Free	119	10/11/2019	ORDER Granting Plaintiff's Notice of Motion and Motion to Withdraw Christopher Hodge as Counsel of Record. Signed by Judge Cathy Ann Bencivengo on 10/11/2019. (anh) (Entered: 10/11/2019)	
	Free	120	10/18/2019	Joint MOTION to Dismiss Counts III and VI of the Second Amended Complaint by Bell Northern Research, LLC. (Hartsell, Steven) (anh). (Entered: 10/18/2019)	
	Free	121	10/21/2019	ORDER Granting Joint Motion for Dismissal as to Counts III and VI of BNR's Second Amended Complaint [Doc. No. 120]. Signed by Judge Cathy Ann Bencivengo on 10/21/2019. (anh) (Entered: 10/21/2019)	
	Runner	122	10/22/2019	Minute Entry for proceedings held before Magistrate Judge Barbara Lynn Major: Mandatory Settlement Conference held on 10/22/2019. Follow-up Conference scheduled for 10/23/19 at 9:00 a.m. (Plaintiff Attorney Sadaf Abdullah; Steven Hartsell). (Defendant Attorney Jason Wolff; Joanna Fuller). (no document attached) (bxr) (Entered: 10/23/2019)	
	Runner	123	10/23/2019	Minute Entry for proceedings held before Magistrate Judge Barbara Lynn Major: Follow-up to Mandatory Settlement Conference held on 10/23/2019. Case settled. Order to follow. (Plaintiff Attorney Sadaf Abdullah; Steven Hartsell; Mieke Malmberg). (Defendant Attorney Jason Wolff; Joanna Fuller). (no document attached) (bxr) (Entered: 10/23/2019)	
	Free	124	10/24/2019	Order Confirming Settlement And Setting Deadline To File Joint Motion For Dismissal. Signed by Magistrate Judge Barbara Lynn Major on 10/24/2019.(mme) (Entered: 10/24/2019)	
	Free	125	11/22/2019	Joint MOTION for Extension of Time to File Motion to Dismiss by Bell Northern Research, LLC. (Hartsell, Steven) (anh). (Entered: 11/22/2019)	
	Free	126	11/22/2019	ORDER Granting Joint Motion to Extend the Deadline for the Parties to File a Joint Motion to Dismiss, and Continuing the Settlement Disposition Conference [ECF No. 125]. Signed by Magistrate Judge Barbara Lynn Major on 11/22/2019. (anh) (Entered: 11/22/2019)	
	Free	127	12/02/2019	Joint MOTION to Dismiss by Bell Northern Research, LLC. (Hartsell, Steven) (anh). (Entered: 12/02/2019)	
	Free	128	12/03/2019	DISMISSAL With Prejudice. Signed by Judge Cathy Ann Bencivengo on 12/3/2019. (anh) (Entered: 12/03/2019)	

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	Availability	#	Date	Proceeding Text	Source
	Free	129	12/03/2019	REPORT of Patent and Trademark Closing, regarding patent and/or trademark number(s) 7,319,889, 8,204,554, **7,990,842**, 8,416,862, 6,941,156, 8,792,432, re 128 Order on Motion to Dismiss. cc:USPTO (mc) (Entered. 01/23/2020)	

Retrieve Document(s)

Patents

Number	Title	Issued	Class	Subclass
7,319,889	System and method for conserving battery power in a mobile station	01/15/2008	455	574
8,204,554	System and method for conserving battery power in a mobile station	06/19/2012	455	574
7,990,842	Backward-compatible long training sequences for wireless communication networks	08/02/2011	370	208
8,416,862	Efficient feedback of channel information in a closed loop beamforming wireless communication system	04/09/2013	375	260
6,941,156	Automatic handoff for wireless piconet multimode cell phone	09/06/2005	455	553.1
8,792,432	Prioritizing RACH message contents	07/29/2014	370	329
7,113,811	System and method for conserving battery power in a mobile station	09/26/2006	455	574
7,646,703	Backward-compatible long training sequences for wireless communication networks	01/12/2010	370	208
6,845,238	Inter-frequency measurement and handover for wireless communications	01/18/2005	455	436
7,738,583	Reduced feedback for beamforming in a wireless communication	06/15/2010	375	267

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US District Court Docket

US District Court for the Southern District of California

(San Diego)

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Header

Case Number: 3:18cv1783
Date Filed: 08/01/2018
Assigned To: Judge Cathy Ann Bencivengo
Referred To: Magistrate Judge Barbara Lynn Major
Nature of Suit: Patent (830)
Cause: Patent Infringement
Lead Docket: None
Other Docket: 3:18cv01786, 3:18cv02864
Jurisdiction: Federal Question

Class Code: Open
Statute: 35:0271
Jury Demand: Plaintiff
Demand Amount: $0
NOS Description: Patent

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Plaintiff

Attorneys

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Proceedings

Retrieve Document(s)

	Availability	#	Date	Proceeding Text	Source
	Free	1	08/01/2018	COMPLAINT with Jury Demand against Coolpad Technologies, Inc., Yulong Computer Communications (Filing fee $ 400 receipt number 0974-11515114). Filed by Bell Northern Research, LLC. (Attachments: # 1 Civil Cover Sheet, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E)The new case number is 3:18-cv-1783-BAS-BLM. Judge Cynthia Bashant and Magistrate Judge Barbara Lynn Major are assigned to the case. (Malmberg, Mieke)(sjt) (dsn) (Entered: 08/02/2018)	
	Free	2	08/01/2018	REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,319,889*, *8,204,554*, ***7,990,842***, *6,941,156*, *8,792,432* cc:USPTO (sjt) (dsn) (Entered: 08/02/2018)	
	Free	3	08/02/2018	Summons issued. Counsel receiving this notice electronically should print this summons and serve it in accordance with Rule 4, Fed.R.Civ.P and LR 4.1. (sjt) (dsn) (Entered: 08/02/2018)	
	Free	4	08/02/2018	NOTICE of Party With Financial Interest by Bell Northern Research, LLC . Identifying Corporate Parent Hilco **Patent** Acquisition 56, LLC, Corporate Parent Hilco IP Merchant Capital, LLC, Corporate Parent Hilco, Inc. for Bell Northern Research, LLC. (Malmberg, Mieke) (jdt). (jao). (Entered: 08/02/2018)	
	Free	5	08/02/2018	NOTICE of Appearance by Mieke Katherine Malmberg on behalf of Bell Northern Research, LLC (Malmberg, Mieke) (jdt). (Entered: 08/02/2018)	
	Free	6	08/06/2018	NOTICE OF RELATED CASE(S) by Bell Northern Research, LLC of case(s) 3:18cv1784, 3:18cv1785, 3:18cv1786. (Malmberg, Mieke). Modified on 8/7/2018 - Proposed Low Number Transfer Order not prepared in this case, this is the low number case (jah). (Entered: 08/06/2018)	

	Availability	#	Date	Proceeding Text	Source
	Free	7	08/07/2018	SUMMONS Returned Executed by Bell Northern Research, LLC. Coolpad Technologies, Inc. served. (Malmberg, Mieke). (jah). (Entered: 08/07/2018)	
	Runner	8	08/13/2018	MINUTE ORDER. Judge Cynthia Bashant has declined assignment pursuant to General Order 598. Case reassigned to Judge Roger T. Benitez for all further proceedings. The new case number is 18cv1783 BEN (BLM).(no document attached) (jcj) (Entered: 08/13/2018)	
	Runner	9	08/14/2018	MINUTE ORDER OF RECUSAL. Judge Roger T. Benitez is no longer assigned. Case reassigned to Judge Cathy Ann Bencivengo for all further proceedings. The new case number is 18cv1783 CAB (BLM).(no document attached) (jcj) (Entered: 08/14/2018)	
	Free	10	08/23/2018	MOTION for Extension of Time to File Answer by Bell Northern Research, LLC. (Malmberg, Mieke) (anh). (Entered: 08/23/2018)	
	Free	11	08/24/2018	ORDER Granting Motion for Extension of Time For Coolpad Technologies, Inc. to Respond to Plaintiff's Complaint [Doc. No. 10]. Signed by Judge Cathy Ann Bencivengo on 8/24/2018. (anh) (Entered: 08/24/2018)	
	Free	12	09/14/2018	ANSWER to 1 Complaint, with Jury Demand , COUNTERCLAIM against Bell Northern Research, LLC(Lu, Yun)Attorney Yun Louise Lu added to party Coolpad Technologies, Inc.(pty:dft), Attorney Yun Louise Lu added to party Yulong Computer Communications(pty:dft) anh). Modified to correct docket text on 10/30/2018 (anh). (Entered: 09/14/2018)	
	Free	13	09/14/2018	NOTICE of Party With Financial Interest by Coolpad Technologies, Inc., Yulong Computer Communications (Lu, Yun) (anh). (jao). (Entered: 09/14/2018)	
	Free	14	09/14/2018	NOTICE of Appearance by Joseph Patrick Reid on behalf of Coolpad Technologies, Inc., Yulong Computer Communications (Reid, Joseph)Attorney Joseph Patrick Reid added to party Coolpad Technologies, Inc.(pty:cc), Attorney Joseph Patrick Reid added to party Coolpad Technologies, Inc.(pty:dft), Attorney Joseph Patrick Reid added to party Yulong Computer Communications(pty:dft), Attorney Joseph Patrick Reid added to party Yulong Computer Communications(pty:cc) (anh). (Entered: 09/14/2018)	
	Free	15	09/14/2018	NOTICE of Appearance by John P Schnurer on behalf of Coolpad Technologies, Inc., Yulong Computer Communications (Schnurer, John)Attorney John P Schnurer added to party Coolpad Technologies, Inc.(pty:cc), Attorney John P Schnurer added to party Coolpad Technologies, Inc.(pty:dft), Attorney John P Schnurer added to party Yulong Computer Communications(pty:dft), Attorney John P Schnurer added to party Yulong Computer Communications(pty:cc) (anh). (Entered: 09/14/2018)	

	Availability	#	Date	Proceeding Text	Source
	Free	16	09/14/2018	NOTICE of Appearance by Thomas Nathan Millikan on behalf of Coolpad Technologies, Inc., Yulong Computer Communications (Millikan, Thomas)Attorney Thomas Nathan Millikan added to party Coolpad Technologies, Inc.(pty:cc), Attorney Thomas Nathan Millikan added to party Coolpad Technologies, Inc.(pty:dft), Attorney Thomas Nathan Millikan added to party Yulong Computer Communications(pty:dft), Attorney Thomas Nathan Millikan added to party Yulong Computer Communications(pty:cc) (anh). (Entered: 09/14/2018)	
	Free	17	09/19/2018	NOTICE AND ORDER for Telephonic Early Neutral Evaluation Conference in a **Patent** Case. Signed by Magistrate Judge Barbara Lynn Major on 9/19/2018.(anh) (Entered: 09/19/2018)	
	Free	18	09/24/2018	Minute Order: It is hereby ORDERED that a case management conference in the above-referenced cases will take place on October 22, 2018 at 2.30 p.m. before Judge Bencivengo in Courtroom 4C.(aef) (Entered: 09/24/2018)	
	Free	19	09/25/2018	ORDER Finding Early Neutral Evaluation Conference Inappropriate and Vacating Certain Dates. Signed by Magistrate Judge Barbara Lynn Major on 9/25/2018.(jdt) (Entered: 09/25/2018)	
	Free	20	10/04/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11755952.)(Application to be reviewed by Clerk.)(Skiermont, Paul)(jrd) (Entered: 10/04/2018)	
	Free	21	10/04/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11756040.)(Application to be reviewed by Clerk.)(Abdullah, Sadaf)(jrd) (Entered: 10/04/2018)	
	Free	22	10/04/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11756081.)(Application to be reviewed by Clerk.)(Hartsell, Steven)(jrd) (Entered: 10/04/2018)	
	Free	23	10/05/2018	REPLY - Other re 12 Answer to Complaint,, Counterclaim, of Coolpad Technologies, Inc. filed by Bell Northern Research, LLC. (Malmberg, Mieke) (anh). (Entered: 10/05/2018)	
	Free	24	10/09/2018	ORDER Approving the Pro Hac Vice Application of Paul J. Skiermont, re 20 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 10/5/2018. (mdc) (Entered: 10/09/2018)	
	Free	25	10/09/2018	ORDER Approving the Pro Hac Vice Application of Sadaf R. Abdullah, re 21 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 10/5/2018. (mdc) (Entered: 10/09/2018)	
	Free	26	10/09/2018	ORDER Approving the Pro Hac Vice Application of Steven W. Hartsell, re 22 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 10/5/2018. (mdc) (Entered: 10/09/2018)	
	Free	27	10/15/2018	**DOCUMENT WITHDRAWN per 28 ** NOTICE Ex Parte Application for Telephonic Appearance by Coolpad Technologies, Inc., Yulong Computer Communications (Reid, Joseph) (anh). (Entered: 10/15/2018)	

	Availability	#	Date	Proceeding Text	Source
	Free	28	10/15/2018	NOTICE OF WITHDRAWAL OF DOCUMENT by Yulong Computer Communications, Coolpad Technologies, Inc. re 27 Notice (Other) filed by Coolpad Technologies, Inc., Yulong Computer Communications . (Reid, Joseph) (anh). (Entered: 10/15/2018)	
	Free	29	10/15/2018	Ex Parte MOTION for Leave to Appear Appear Telephonically by Coolpad Technologies, Inc., Yulong Computer Communications. (Reid, Joseph) (anh). (Entered: 10/15/2018)	
	Free	30	10/15/2018	REPORT of Rule 26(f) Planning Meeting. (Abdullah, Sadaf) (anh). (Entered: 10/15/2018)	
	Free	31	10/15/2018	ORDER Granting Ex Parte Application for Telephonic Appearance [Doc. No. 29] Signed by Judge Cathy Ann Bencivengo on 10/15/2018. (anh) (Entered: 10/16/2018)	
	Free	32	10/16/2018	NOTICE of Appearance by James Young Hurt on behalf of Coolpad Technologies, Inc. (Hurt, James)Attorney James Young Hurt added to party Coolpad Technologies, Inc.(pty:dft) (anh). (Entered: 10/16/2018)	
	Runner	33	10/22/2018	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Case Management Conference held on 10/22/2018.(Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf R. Addullah and Mieke K. Malmberg). (Defendant Attorney Thomas Millikan (telephonic)). (no document attached) (lmh) (Entered: 10/22/2018)	
	Free	34	10/23/2018	Case Management Order Regulating Discovery and Other Pretrial Proceedings in a **Patent** Case. Signed by Magistrate Judge Barbara Lynn Major on 10/23/2018. (anh) (Entered: 10/23/2018)	
	Free	35	10/30/2018	**MOTION WITHDRAWN PER DOC. NO. 38 ** MOTION for Alternative Service by Bell Northern Research, LLC. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of S. Abdullah, # 3 Exhibit 1, # 4 Declaration of P. Skiermont, # 5 Exhibit 2, # 6 Declaration of A. Dean) (Malmberg, Mieke) (anh). (Entered: 10/30/2018)	
	Free	36	11/02/2018	ORDER Setting Briefing Schedule for Motion for Alternative Service. Signed by Judge Cathy Ann Bencivengo on 11/2/2018.(anh) (Entered: 11/02/2018)	
	Free	37	11/07/2018	WAIVER OF SERVICE Returned Executed by Bell Northern Research, LLC, as to Yulong Computer Communications. (Abdullah, Sadaf) (anh). (Entered: 11/07/2018)	
	Free	38	11/07/2018	NOTICE of Withdrawal of Motion for Alternative Service by Bell Northern Research, LLC re 35 MOTION for Alternative Service (Abdullah, Sadaf) (anh). (Entered: 11/07/2018)	
	Free	39	11/16/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11910643.) (Application to be reviewed by Clerk.) (Hodge, Christopher) (mdc) (Entered: 11/16/2018)	
	Free	40	11/20/2018	ORDER Approving the Pro Hac Vice Application of Christopher M. Hodge (Re: Doc. No. 39 Request to Appear Pro Hac Vice). Signed by Judge Cathy Ann Bencivengo on 11/19/2018.(jrd) (Entered: 11/20/2018)	

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	Availability	#	Date	Proceeding Text	Source
	Free	41	11/27/2018	Joint MOTION and Stipulation of Dismissal as to Count 5 of Plaintiff's Complaint and Coolpad Technologies, Inc.'s Counterclaims 1 and 2 Relating to U.S. Patent No. 8,792,432 by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered: 11/27/2018)	
	Free	42	11/29/2018	ORDER Granting Joint Motion and Stipulation of Dismissal as to Count 5 of Plaintiff's Complaint and Coolpad Technologies, Inc.'s Counterclaims 1 and 2 Relating to U.S. Patent No. 8,792,432[Doc. No. 41]. Signed by Judge Cathy Ann Bencivengo on 11/29/2018. (anh) (Entered: 11/30/2018)	
	Free	43	11/30/2018	Joint MOTION for Protective Order , Joint MOTION for Production of Electronically Stored Information (ESI) by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A - Proposed Protective Order, # 2 Exhibit B - Proposed Order Governing Discovery of Electronically Stored Information)(Abdullah, Sadaf) (anh). (Entered: 11/30/2018)	
	Free	44	12/05/2018	ORDER Granting 43 Joint Motion for Entry of Protective Order and ESI Order with Modifications. Signed by Magistrate Judge Barbara Lynn Major on 12/5/2018. (rmc) (Entered: 12/05/2018)	
	Free	45	01/02/2019	NOTICE OF RELATED CASE(S) by Bell Northern Research, LLC of case(s) 3:18-cv-2864 . (Malmberg, Mieke) (anh). (Entered: 01/02/2019)	
	Free	46	01/28/2019	NOTICE of Appearance by James Young Hurt on behalf of Coolpad Technologies, Inc., Yulong Computer Communications (Hurt, James)Attorney James Young Hurt added to party Coolpad Technologies, Inc.(pty:cc), Attorney James Young Hurt added to party Yulong Computer Communications(pty:dft) (anh). (Entered: 01/28/2019)	
	Free	47	01/28/2019	ANSWER to Complaint by Yulong Computer Communications.(Hurt, James) (anh). (Entered: 01/28/2019)	
	Free	48	01/28/2019	NOTICE of Party With Financial Interest by Yulong Computer Communications . Identifying Other Affiliate Yulong Infotech Inc., Other Affiliate Digital Tech Inc. for Yulong Computer Communications. (Hurt, James) (anh). (jao). (Entered: 01/28/2019)	
	Free	49	02/05/2019	MOTION to Clarify Case Management Order (Unopposed), MOTION to Consolidate Cases (Unopposed) by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered: 02/05/2019)	
	Free	50	02/08/2019	ORDER Granting Unopposed Motion for Clarification of the CMO and Consolidation for Pre-Trial [Doc. No. 49]. Signed by Judge Cathy Ann Bencivengo on 2/8/2019. (anh) (Entered: 02/11/2019)	
	Free	51	03/08/2019	<missing-replace>Memo of Points and AuthoritiesDeclaration of Sadaf AbdullahExhibit IndexExhibit 1Exhibit 2Exhibit 3Exhibit 4Exhibit 5Exhibit 6Exhibit 7</missing-replace>	

	Availability	#	Date	Proceeding Text	Source
	Free	52	03/11/2019	MOTION to Strike Document 51 MOTION to Strike Affirmative Defenses (Unopposed) by Bell Northern Research, LLC. (Attachments: # 1 Memo of Points and Authorities)(Hartsell, Steven) (anh). (Entered: 03/11/2019)	
	Free	53	03/11/2019		
	Free	54	03/12/2019	**WITHDRAWN PER DOC. 55 ** MOTION to Strike Affirmative Defenses by Bell Northern Research, LLC. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of Sadaf Abdullah, # 3 Exhibits Index, # 4 Exhibit 1, # 5 Exhibit 2, # 6 Exhibit 3, # 7 Exhibit 4, # 8 Exhibit 5, # 9 Exhibit 6, # 10 Exhibit 7)(Abdullah, Sadaf) (anh). (anh). (Entered: 03/12/2019)	
	Free	55	04/01/2019	NOTICE of Withdrawal of Motion to Strike Affirmative Defenses by Bell Northern Research, LLC re 54 MOTION to Strike Affirmative Defenses (Abdullah, Sadaf) (anh). (Entered: 04/01/2019)	
	Free	56	04/02/2019	MOTION for Leave to File First Amended Answers to Complaint by Coolpad Technologies, Inc., Yulong Computer Communications. (Attachments: # 1 Memo of Points and Authorities, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4)(Hurt, James) (anh). (Entered: 04/02/2019)	
	Free	57	04/04/2019	ORDER Granting Defendants' Unopposed Motion for Leave to File First Amended Answers [Doc. No. 56]. Signed by Judge Cathy Ann Bencivengo on 4/4/2019. (anh) (Entered: 04/04/2019)	
	Free	58	04/04/2019	First Amended ANSWER to 12 Answer to Complaint,, Counterclaim, , COUNTERCLAIM against Bell Northern Research, LLC by Coolpad Technologies, Inc..(Hurt, James) (dlg). (Entered: 04/04/2019)	
	Free	59	04/04/2019	First Amended ANSWER to 12 Answer to Complaint,, Counterclaim, , COUNTERCLAIM against Bell Northern Research, LLC by Yulong Computer Communications. (Hurt, James) (dlg). (Entered: 04/04/2019)	
	Free	60	04/12/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12400143.) (Application to be reviewed by Clerk.) (Gasser, Alexander) (mdc) (Entered: 04/12/2019)	
	Free	61	04/15/2019	ORDER Approving the Pro Hac Vice Application of Alexander E. Gasser, re 60 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 4/15/2019.(dsn) (Entered: 04/16/2019)	
	Free	62	04/18/2019	REPLY - Other re 58 Answer to Counterclaim, filed by Bell Northern Research, LLC. (Hodge, Christopher) (anh). (Entered: 04/18/2019)	
	Free	63	04/19/2019	JOINT HEARING STATEMENT by Bell Northern Research, LLC. (Attachments: # 1 Appendix A - Joint Claim Construction Worksheet, # 2 Appendix B - Joint Claim Construction Chart)(Abdullah, Sadaf) (anh). (Entered: 04/19/2019)	

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	Availability	#	Date	Proceeding Text	Source
	Runner	64	04/26/2019	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Status Hearing re Claim Construction held on 4/26/2019. Claim Construction Hearing confirmed for 6/19/2019 09:00 AM in Courtroom 4C before Judge Cathy Ann Bencivengo. (Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Abdullah and Steven Hartsell). (Defendant Attorney Thomas Millikan and James Hurt). (no document attached) (lmh) (Entered: 04/29/2019)	
	Online	65	05/06/2019	NOTICE OF FILING OF OFFICIAL TRANSCRIPT of Proceedings held on 4/26/2019 before Judge Cathy Ann Bencivengo. Court Reporter/Transcriber: Mauralee Ramirez. Transcript may be viewed at the court public terminal or purchased through the Court Reporter/Transcriber before the deadline for Release of Transcript Restriction. After that date it may be obtained through PACER or the Court Reporter/Transcriber. If redaction is necessary, parties have seven calendar days from the file date of the Transcript to E-File the Notice of Intent to Request Redaction. The following deadlines would also apply if requesting redaction: Redaction Request Statement due to Court Reporter/Transcriber 5/28/2019. Redacted Transcript Deadline set for 6/6/2019. Release of Transcript Restriction set for 8/5/2019. (Transcript filed in case numbers 3:18-cv-01783-CAB-BLM, 3:18-cv-01784-CAB-BLM, 3:18-cv-01785-CAB-BLM,3:18-cv-01786-CAB-BLM, and 3:18-cv-02864-CAB-BLM.) (akr) (Entered: 05/06/2019)	
	Free	66	05/13/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12504781) (Application to be reviewed by Clerk.) (Udick, Steven) (mdc) (Entered: 05/13/2019)	
	Free	67	05/17/2019	ORDER Approving the Pro Hac Vice Application of Steven J. Udick, re 66 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 5/16/2019. (mdc) (Entered: 05/17/2019)	
	Free	68	05/24/2019	Joint MOTION for Summary Judgment on Indefiniteness by Coolpad Technologies, Inc., Yulong Computer Communications. (Attachments: # 1 Memo of Points and Authorities in Support of Defendants' Joint Motion for Summary Judgment on Indefiniteness, # 2 Declaration of Amol A. Parikh in Support of Defendants' Joint Motion For Summary Judgment on Indefiniteness, # 3 Exhibit A, # 4 Exhibit B, # 5 Exhibit C, # 6 Exhibit D, # 7 Exhibit E1, # 8 Exhibit E2, # 9 Exhibit F, # 10 Exhibit G, # 11 Exhibit H) (Hurt, James) (anh). (Entered: 05/24/2019)	
	Free	69	05/24/2019	CLAIM CONSTRUCTION BRIEF by Bell Northern Research, LLC. (Attachments: # 1 Declaration of S. Abdullah, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E, # 7 Exhibit F, # 8 Exhibit G, # 9 Exhibit H, # 10 Exhibit I, # 11 Exhibit J, # 12 Exhibit K, # 13 Exhibit L, # 14 Exhibit M, # 15 Exhibit N, # 16 Exhibit O, # 17 Exhibit P, # 18 Exhibit Q, # 19 Exhibit R, # 20 Exhibit S, # 21 Exhibit T, # 22 Exhibit U, # 23 Exhibit V, # 24 Exhibit W)(Abdullah, Sadaf) (anh). (Entered: 05/24/2019)	

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	Availability	#	Date	Proceeding Text	Source
	Free	70	05/24/2019	CLAIM CONSTRUCTION BRIEF by Coolpad Technologies, Inc., Yulong Computer Communications. (Attachments: # 1 Declaration of Joanna M. Fuller in Support of Defendants' Opening Claim Construction Brief, # 2 Exhibit A (Part 1), # 3 Exhibit A (Part 2), # 4 Exhibit A (Part 3), # 5 Exhibit B, # 6 Exhibit C (Part 1), # 7 Exhibit C (Part 2), # 8 Exhibit D, # 9 Exhibit E, # 10 Exhibit F, # 11 Exhibit G, # 12 Exhibit H, # 13 Exhibit I, # 14 Exhibit J, # 15 Exhibit K, # 16 Exhibit L)(Hurt, James) (anh). (Entered: 05/24/2019)	
	Online	71	06/12/2019	SUPPLEMENTAL DOCUMENT by Bell Northern Research, LLC re 63 Joint Hearing Statement Supplemental Joint Hearing Statement. (Hartsell, Steven) (anh). (Entered: 06/12/2019)	
	Online	72	06/14/2019	RESPONSE TO CLAIM CONSTRUCTION BRIEF by Coolpad Technologies, Inc., Yulong Computer Communications. (Attachments: # 1 Declaration Hurt Decl, # 2 Exhibit A to Hurt Decl, # 3 Exhibit B to Hurt Decl, # 4 Exhibit C to Hurt Decl, # 5 Exhibit D to Hurt Decl) (Hurt, James) (anh). (Entered: 06/14/2019)	
	Online	73	06/14/2019	RESPONSE TO CLAIM CONSTRUCTION BRIEF by Bell Northern Research, LLC. (Attachments: # 1 Declaration of S. Abdullah, # 2 Exhibit X, # 3 Exhibit Y, # 4 Exhibit Z, # 5 Exhibit AA)(Abdullah, Sadaf) (anh). (Entered: 06/14/2019)	
	Online	74	06/14/2019	RESPONSE in Opposition re 68 Joint MOTION for Summary Judgment on Indefiniteness filed by Bell Northern Research, LLC. (Attachments: # 1 Declaration of S. Abdullah, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4, # 6 Exhibit 5)(Abdullah, Sadaf) (anh). (Entered: 06/14/2019)	
	Online	75	06/17/2019	MOTION to Allow the Use of Electrical Equipment in the Courtroom during Hearing Scheduled for June 19-20, 2019 by Bell Northern Research, LLC. (Hartsell, Steven) (anh). (Entered: 06/17/2019)	
	Free	76	06/17/2019	Joint MOTION to Allow the Use of Electrical Equipment in the Courtroom by Coolpad Technologies, Inc., Yulong Computer Communications. (Hurt, James) (anh). (Entered: 06/17/2019)	
	Online	77	06/17/2019	ORDER Granting Plaintiff's Motion for Order Authorizing Use of Electronic Equipment in Courtroom for Claim Construction Hearing Schedule for June 19-20, 2019 Signed by Judge Cathy Ann Bencivengo on 6/17/2019. (anh) (Entered: 06/18/2019)	
	Online	78	06/18/2019	ORDER Granting Defendants' Joint Motion for Order Authorizing Use of Electronic Equipment in Courtroom for Claim Construction Hearing June 19-20, 2019. Signed by Judge Cathy Ann Bencivengo on 6/18/2019. (anh) (Entered: 06/18/2019)	

	Availability	#	Date	Proceeding Text	Source
	Runner	79	06/19/2019	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Claims Construction Hearing held on 6/19/2019 and continued to 6/20/2019 09:00 AM in Courtroom 4C before Judge Cathy Ann Bencivengo. (Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Raja Abdullah, Steven Harsell, Paul Skiermont). (Defendant Attorney James Hurt and Thomas Millikan). (no document attached) (imh) (Entered: 06/20/2019)	
	Runner	80	06/20/2019	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Claims Construction Hearing held and completed on 6/20/2019. Court to issue written Claims Construction Order.(Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Raja Abdullah, Steven Hartsell and Paul Skiermont). (Defendant Attorney James Hurt and Thomas Millikan). (no document attached) (imh) (Entered: 06/21/2019)	
	Online	81	07/19/2019	MOTION for Joinder in Huawei Defendants' Motion for Stay Pending Inter Partes Review by Coolpad Technologies, Inc., Yulong Computer Communications. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration James Young Hurt, # 3 Exhibit A to Hurt Decl) (Hurt, James) (anh). (Entered: 07/19/2019)	
	Online	82	07/19/2019	NOTICE of Filing of Petitions for Inter Partes Review by Coolpad Technologies, Inc., Yulong Computer Communications (Hurt, James) (anh). (Entered: 07/19/2019)	
	Online	83	08/09/2019	NOTICE of Filing of Petition for Inter Partes Review by Coolpad Technologies, Inc., Yulong Computer Communications (Hurt, James) (anh). (Entered: 08/09/2019)	
	Free	84	08/09/2019	Claim Construction ORDER and ORDER on Motions for Summary Judgment [Doc. No. 68]. Signed by Judge Cathy Ann Bencivengo on 8/9/2019. (anh) (Entered: 08/09/2019)	
	Online	85	08/09/2019	RESPONSE in Opposition re 81 MOTION for Joinder in Huawei Defendants' Motion for Stay Pending Inter Partes Review filed by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Steven W. Hartsell, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4, # 6 Exhibit 5, # 7 Exhibit 6, # 8 Exhibit 7, # 9 Exhibit 8, # 10 Exhibit 9, # 11 Exhibit 10)(Hartsell, Steven) (anh). (Entered: 08/09/2019)	
	Online	86	08/12/2019	ORDER on Request for Pre-Institution Stay of the Litigation [Doc. No. 81]. Signed by Judge Cathy Ann Bencivengo on 8/12/2019. (anh) (Entered: 08/12/2019)	
	Free	87	08/21/2019	SCHEDULING ORDER Regulating Discovery and Other Pretrial Proceedings. Signed by Magistrate Judge Barbara Lynn Major on 08/21/2019.(mme) (Entered: 08/22/2019)	
	Online	88	08/26/2019	Joint MOTION to Amend/Correct 44 Order on Motion for Protective Order, Order on Motion for Production of Electronically Stored Information (ESI) by Bell Northern Research, LLC. (Attachments: # 1 Proposed Order) (Hartsell, Steven) (anh). (Entered: 08/26/2019)	

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	Availability	#	Date	Proceeding Text	Source
	Online	89	08/29/2019	ORDER Concerning the Parties' Discovery Dispute. Signed by Magistrate Judge Barbara Lynn Major on 8/29/2019.(anh) (Entered: 08/29/2019)	
	Online	90	08/30/2019	ORDER Granting Joint Motion to Correct Protective Order [ECF No. 88]. Signed by Magistrate Judge Barbara Lynn Major on 8/30/2019. (anh) (Entered: 08/30/2019)	
	Online	91	09/05/2019	Joint MOTION for Protective Order [Motion for Stipulated Supplemental Protective Order] by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A)(Udick, Steven) (rmc). (Entered: 09/05/2019)	
	Online	92	09/06/2019	NOTICE of Appearance by Jaime Olin on behalf of Bell Northern Research, LLC (Olin, Jaime)Attorney Jaime Olin added to party Bell Northern Research, LLC(pty:pla) (anh). (Entered: 09/06/2019)	
	Online	93	09/09/2019	ORDER Granting Joint Motion for Entry of Protective Order Between Plaintiff, Defendants, and Non-Party Qualcomm Incorporated [ECF No. 91]. Signed by Magistrate Judge Barbara Lynn Major on 9/9/2019. (anh) (Entered: 09/09/2019)	
	Online	94	09/20/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12966595.)(Application to be reviewed by Clerk.)(Ramirez, Joseph)(jrd) (Entered: 09/20/2019)	
	Online	95	09/23/2019	ORDER Approving the Pro Hac Vice Application of Joseph M. Ramirez, re 94 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 9/20/2019. (mdc) (Entered: 09/23/2019)	
	Online	96	09/30/2019	NOTICE Regarding Nancy Zhang Appearance at the October 21, 2019 Mandatory Settlement Conference by Coolpad Technologies, Inc., Yulong Computer Communications (Attachments: # 1 Declaration James Young Hunt, # 2 Exhibit 1)(Hunt, James) (anh). (Entered: 09/30/2019)	
	Free	97	10/04/2019	Joint MOTION to Dismiss Counts III and IV of the Complaint and Partial Dismissal of Counts I and II of Coolpad's Counterclaims by Bell Northern Research, LLC. (Hartsell, Steven) (anh). (Entered: 10/04/2019)	
	Free	98	10/08/2019	ORDER Granting Joint Motion for Dismissal as to Counts III and IV of BNR'S Complaint and Partial Dismissal of Counts I and II of Coolpad's Counterclaims. Signed by Judge Cathy Ann Bencivengo on 10/8/2019. (anh) (Entered: 10/08/2019)	
	Online	99	10/11/2019	MOTION to Withdraw as Attorney Christopher M. Hodge by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Steven W. Hartsell in Support)(Hartsell, Steven) (anh). (Entered: 10/11/2019)	
	Online	100	10/11/2019	ORDER Granting Plaintiff's Notice of Motion and Motion to Withdraw Christopher Hodge as Counsel of Record. Signed by Judge Cathy Ann Bencivengo on 10/11/2019. (anh) (Entered: 10/11/2019)	

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	Availability	#	Date	Proceeding Text	Source
	Online	101	10/14/2019	Joint MOTION to Continue Mandatory Settlement Conference by Coolpad Technologies, Inc., Yulong Computer Communications. (Attachments: # 1 Declaration of Joseph P. Reid in Support of Joint Motion to Continue Mandatory Settlement Conference)(Hurt, James) (anh). (Entered: 10/14/2019)	
	Runner	102	10/16/2019	ORDER GRANTING in part the parties' joint motion [ECF No. 101] to continue the October 21, 2019 mandatory settlement conference ("MSC"). The parties are ORDERED to contact Judge Major's chambers (by telephone) no later than 3.00 p.m. on October 18, 2019 to inform the Court whether or not the subject visa has been issued. If the visa has been issued, the October 21, 2019 MSC will go forward as scheduled. If the visa has not been issued, the Court will reschedule the MSC. Currently, none of the parties' proposed dates are available on the Court's calendar. IT IS SO ORDERED. Signed by Magistrate Judge Barbara Lynn Major on 10/16/2019. (no document attached) (bxr) (Entered: 10/16/2019)	
	Online	103	10/18/2019	NOTICE Regarding Nancy Zhangs Appearance At The October 21, 2019 Mandatory Settlement Conference by Coolpad Technologies, Inc., Yulong Computer Communications re 102 Order on Motion to Continue,, (Hurt, James) (anh). (Entered: 10/18/2019)	
	Runner	104	10/18/2019	ORDER: In light of Defendants' notice regarding Nancy Zhang's appearance at the Mandatory Settlement Conference ("MSC"), the Court VACATES the MSC currently scheduled for October 21, 2019. See also ECF No. 102. Signed by Magistrate Judge Barbara Lynn Major on 10/18/19.(no document attached) (bxr) (Entered: 10/18/2019)	
	Online	105	10/21/2019	ORDER Resetting Mandatory Settlement Conference. Signed by Magistrate Judge Barbara Lynn Major on 10/21/2019.(anh) (Entered: 10/21/2019)	
	Online	106	10/28/2019	NOTICE Regarding Nancy Zhang's Visa by Coolpad Technologies, Inc., Yulong Computer Communications (Hurt, James) (anh). (Entered: 10/28/2019)	
	Free	107	10/28/2019	ORDER Resetting Mandatory Settlement Conference. Signed by Magistrate Judge Barbara Lynn Major on 10/28/2019.(anh) (Entered: 10/28/2019)	
	Runner	108	11/12/2019	Minute Entry for proceedings held before Magistrate Judge Barbara Lynn Major: Mandatory Settlement Conference held on 11/12/2019. Case did not settle. (Plaintiff Attorney Sadaf Abdullah; Mieke Malmberg). (Defendant Attorney Joseph Reid; Thomas Millikan; Mengke Xing). (no document attached) (bxr) (Entered: 11/13/2019)	

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Availability	#	Date	Proceeding Text	Source
Online	109	11/27/2019	MOTION to Strike Portions of the Opening Expert Report of Jonathan Wells by Bell Northern Research, LLC. (Attachments: # 1 Memo of Points and Authorities in Support of Motion to Strike Portions of the Opening Expert Report of Jonathan Well, # 2 Declaration of Sadaf R. Abdullah in Support of Motion to Strike Portions of the Opening Expert Report of Jonathan Well, # 3 Exhibit A, # 4 Exhibit B, # 5 Exhibit C, # 6 Exhibit D, # 7 Exhibit E, # 8 Exhibit F, # 9 Exhibit G, # 10 Exhibit H, # 11 Exhibit I, # 12 Exhibit J, # 13 Exhibit K, # 14 Exhibit L, # 15 Exhibit M) (Abdullah, Sadaf) (Entered: 11/27/2019)	
Online	110	12/19/2019	RESPONSE in Opposition re 109 MOTION to Strike Portions of the Opening Expert Report of Jonathan Wells filed by Coolpad Technologies, inc., Yulong Computer Communications. (Attachments: # 1 Declaration of Amit A. Parikh in Support of Defendants' Opposition to Motion to Strike Portions of the Opening Expert Report of Jonathan Wells, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 2A, # 5 Exhibit 3, # 6 Exhibit 4, # 7 Exhibit 5, # 8 Exhibit 5A, # 9 Exhibit 6, # 10 Exhibit 6A, # 11 Exhibit 7, # 12 Exhibit 8, # 13 Exhibit 8A, # 14 Exhibit 9, # 15 Exhibit 10, # 16 Exhibit 11, # 17 Exhibit 12)(Reid, Joseph) (anh). (Entered: 12/19/2019)	
Online	111	12/26/2019	REPLY to Response to Motion re 109 MOTION to Strike Portions of the Opening Expert Report of Jonathan Wells filed by Bell Northern Research, LLC. (Attachments: # 1 Declaration Supplemental Declaration of Sadaf R. Abdullah, # 2 Exhibit N)(Abdullah, Sadaf) (anh). (Entered: 12/26/2019)	
Online	112	01/06/2020	MINUTE ORDER: It is hereby ORDERED that an on-the-record telephonic conference is set forJanuary 9, 2020 at 10:00 a.m. before Judge Bencivengo to discuss Bell NorthernResearch, LLCs Motion to Strike Portions of the Opening Expert Report ofJonathan Wells. The parties shall arrange their telephonic appearances throughCourtCall as explained in the Courts Chambers Rules. It is SO ORDERED.(anh) (Entered: 01/06/2020)	
Runner	113	01/09/2020	Minute Order for proceedings held before Judge Cathy Ann Bencivengo: Telephonic Status Conference held via CourtCall 1/9/2020. 109 MOTION to Strike Portions of the Opening Expert Report of Jonathan Wells is granted in part/denied in part for reasons stated by the Court on the record. (Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Abdullah).(Defendant Attorney James Hurt and Joseph Reid). (no document attached) (lmh) (Entered: 01/09/2020)	
Online	114	01/15/2020	NOTICE of Appearance by Jason Sheffield Angell on behalf of Broadcom Corporation (Angell, Jason)Attorney Jason Sheffield Angell added to party Broadcom Corporation(pty:misc) (anh). (Entered: 01/15/2020)	
Online	115	01/15/2020	Ex Parte MOTION Order Enlarging Time by Broadcom Corporation, Coolpad Technologies, Inc.. (Attachments: # 1 Declaration)(Angell, Jason)Attorney Jason Sheffield Angell added to party Coolpad Technologies, Inc.(pty:cc) (anh). (Entered: 01/15/2020)	

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	Availability	#	Date	Proceeding Text	Source
	Online	116	01/16/2020	ORDER Enlarging time for Broadcom Corporation to File a Motion to Seal [Doc. No. 115]. Signed by Judge Cathy Ann Bencivengo on 1/16/2020. (anh) (Entered: 01/16/2020)	
	Online	117	01/17/2020	NOTICE of Appearance of Counsel for Third Party by Mark Andrew Woodmansee on behalf of Kyocera International Inc. (Woodmansee, Mark Andrew)Attorney Mark Andrew Woodmansee added to party Kyocera International Inc.(pty:misc)(anh). (Entered: 01/17/2020)	
	Online	118	01/17/2020	MOTION to File Documents Under Seal (Woodmansee, Mark Andrew) (Entered: 01/17/2020)	
	Online	119	01/17/2020	MOTION to File Documents Under Seal (With attachments)(Hurt, James) (Entered: 01/17/2020)	
	Online	120	01/17/2020	**DOCUMENT STRICKEN PER DOC NO. 124 ** (Entered: 01/17/2020)	
	Online	121	01/17/2020	MOTION to File Documents Under Seal (With attachments)(Hartsell, Steven) (Entered: 01/17/2020)	
	Online	122	01/21/2020	MOTION to Strike Document 120 MOTION to File Documents Under Seal Due to Inadvertent Filing of Confidential Material by Coolpad Technologies, Inc., Yulong Computer Communications. (Hurt, James) (anh). (Entered: 01/21/2020)	
	Online	123	01/21/2020	ORDER On Motions to File Under Seal (118 , 119 , 121). Signed by Judge Cathy Ann Bencivengo on 1/21/20. (dlg) (Entered: 01/21/2020)	
	Online	124	01/21/2020	ORDER Granting Motion to Strike Document No 120. [Doc. No. 122]. Signed by Judge Cathy Ann Bencivengo on 1/21/2020. (anh) (Entered: 01/21/2020)	
	Online	125	01/21/2020	MOTION to File Documents Under Seal (With attachments)(Hurt, James) (aef). (Entered: 01/21/2020)	
	Online	126	01/21/2020	ORDER Granting 125 Motion to File Documents Under Seal. Signed by Judge Cathy Ann Bencivengo on 1/21/20. (dlg) (Entered: 01/21/2020)	
	Online	127	01/22/2020	MOTION to File Documents Under Seal (With attachments)(Angell, Jason) (aef). (Entered: 01/22/2020)	
	Online	128	01/22/2020	NOTICE of Appearance by Rachael Hiatt on behalf of Broadcom Corporation (Hiatt, Rachael)Attorney Rachael Hiatt added to party Broadcom Corporation(pty:misc) (Entered: 01/22/2020)	
	Online	129	01/23/2020	ORDER on Broadcom's Motions to File Under Seal. (ECF 127) Signed by Judge Cathy Ann Bencivengo on 1/23/2020. (aef) (Entered: 01/23/2020)	
	Free	130	01/24/2020	<missing-replace>Exhibit 1AExhibit 12AExhibit 13AExhibit 16AExhibit 17AExhibit 18AExhibit 19A</missing-replace>	
	Online	131	01/24/2020	SEALED LODGED Proposed Document re: 130 MOTION to File Documents Under Seal. Document to be filed by Clerk if Motion to Seal is granted. (With attachments) (Hartsell, Steven) (dlg). (Entered: 01/24/2020)	

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	Availability	#	Date	Proceeding Text	Source
	Free	132	01/24/2020	MOTION to Strike the Non-Infringing Alternatives Opinions of Drs. Lin and Kennedy and, in the Alternative, Exclude Certain Opinions of Dr. Kennedy by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Steven J. Udick, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4, # 6 Exhibit 5A, # 7 Exhibit 6, # 8 Exhibit 7, # 9 Exhibit 8)(Udick, Steven) (sjm). (Entered: 01/24/2020)	
	Free	133	01/24/2020	MOTION for Partial Summary Judgment and Motion to Strike / Daubert Motion by Coolpad Technologies, Inc., Yulong Computer Communications. (Attachments: # 1 Declaration of James Young Hurt, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E, # 7 Exhibit F, # 8 Exhibit G, # 9 Exhibit H, # 10 Exhibit I, # 11 Exhibit J, # 12 Exhibit K, # 13 Exhibit L, # 14 Exhibit M, # 15 Exhibit N, # 16 Exhibit O, # 17 Exhibit P, # 18 Exhibit Q, # 19 Exhibit R, # 20 Exhibit S, # 21 Exhibit T, # 22 Exhibit U, # 23 Exhibit V, # 24 Exhibit W, # 25 Exhibit X, # 26 Exhibit Y, # 27 Exhibit Z, # 28 Exhibit AA, # 29 Exhibit AB, # 30 Exhibit AC, # 31 Exhibit AD, # 32 Exhibit AE) (Hurt, James) (sjm). (Entered: 01/24/2020)	
	Free	134	01/24/2020	MOTION for Partial Summary Judgment that Defendants Failed to Meet Their Burden of Production to Limit Damages Pursuant to 35 U.S.C. 287 by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Steven W. Hartsell, # 2 Exhibit 1)(Skiermont, Paul) (sjm). (Entered: 01/24/2020)	
	Online	135	01/24/2020	SEALED Document - Defendants' Motion for Partial Summary Judgment and Motion to Strike/Daubert Motion re: 119 MOTION to File Documents Under Seal, 130 MOTION to File Documents Under Seal, 125 MOTION to File Documents Under Seal, 127 MOTION to File Documents Under Seal. Document to be filed by Clerk if Motion to Seal is granted. (With attachments)(Hurt, James) Modified on 1/28/2020 (dlg). (Entered: 01/24/2020)	
	Free	136	01/24/2020	NOTICE of Joint Request for Additional Claim Construction by Coolpad Technologies, Inc., Yulong Computer Communications (Hurt, James) (sjm). (Entered: 01/24/2020)	
	Online	137	01/27/2020	NOTICE of Withdrawal by Bell Northern Research, LLC re 131 Sealed Lodged Proposed Document (Hartsell, Steven) (Entered: 01/27/2020)	
	Online	138	01/27/2020	SEALED Document - Exhibit 5 - re: 119 MOTION to File Documents Under Seal. Document to be filed by Clerk if Motion to Seal is granted. (Hartsell, Steven) Modified on 1/28/2020 (dlg). (Entered: 01/27/2020)	
	Online	139	01/29/2020	NOTICE of Institution of Petitions for Inter Partes Review by Coolpad Technologies, Inc., Yulong Computer Communications (Hurt, James) (anh). (Entered: 01/29/2020)	

	Availability	#	Date	Proceeding Text	Source
	Free	140	01/29/2020	MOTION to Stay Renewed Motion to Stay Pending Inter Partes Review by Coolpad Technologies, Inc., Yulong Computer Communications. (Attachments: # 1 Declaration of James Young Hurt, # 2 Declaration of Thomas Millikan, # 3 Exhibit A, # 4 Exhibit B, # 5 Exhibit C, # 6 Exhibit D, # 7 Exhibit E, # 8 Exhibit F, # 9 Exhibit G, # 10 Exhibit H)(Hurt, James) (anh). (Entered: 01/29/2020)	
	Online	141	01/30/2020	Minute Order: It is hereby ORDERED that an off-the-record telephonic conference is set for January 31, 2020 at 3:00 p.m. before Judge Bencivengo to discuss case management issues related to the pending motions and request for additional claim construction. Plaintiffs counsel shall initiate the conference by calling Judge Bencivengos chambers with defense counsel on the line. It is SO ORDERED.(anh) (Entered: 01/30/2020)	
	Online	142	01/30/2020	ORDER Granting 130 Motion to File Documents Under Seal. Signed by Judge Cathy Ann Bencivengo on 1/30/2020. (aef) (Entered: 01/30/2020)	
	Online	143	01/30/2020	Minute Order: The Court previously scheduled an off-the-record teleconference with the parties in case number 18cv1783 [Doc. No. 141 in 18cv1783]. In light of ZTEs notice of it intent to file a motion to stay [Doc. No. 164 in 18cv1786], it is now ORDERED that ZTE shall also participate in the off-the-record telephonic conference set for January 31, 2020 at 3:00 p.m. before Judge Bencivengo to discuss case management issues related to the pending motions in both cases and request for additional claim construction in Case Number 18cv1783. Plaintiffs counsel shall initiate the conference by calling Judge Bencivengos chambers with defense counsel for both the Coolpad and ZTE defendants on the line. It is SO ORDERED.(anh) (Entered: 01/30/2020)	
	Online	144	01/30/2020	Minute Order: The Court previously scheduled an off-the-record teleconference with the parties in case number 18cv1783 [Doc. No. 141 in 18cv1783]. In light of ZTEs notice of it intent to file a motion to stay [Doc. No. 164 in 18cv1786], it is now ORDERED that ZTE shall also participate in the off-the-record telephonic conference set for January 31, 2020 at 3:00 p.m. before Judge Bencivengo to discuss case management issues related to the pending motions in both cases and request for additional claim construction in Case Number 18cv1783. Plaintiffs counsel shall initiate the conference by calling Judge Bencivengos chambers with defense counsel for both the Coolpad and ZTE defendants on the line. It is SO ORDERED.(anh) (Entered: 01/30/2020)	
	Free	145	01/31/2020	Briefing Schedule. Signed by Judge Cathy Ann Bencivengo on 1/31/2020.(anh) (Entered: 01/31/2020)	
	Online	146	02/05/2020	MINUTE ORDER: In light of the motion for clarification filed in Case Number 18cv1786 [Doc. No. 166], the Court clarifies that item 3 of the briefing schedule issued on January 31,2020 [Doc. No. 165 in Case No. 18cv1786], applies to all motions filed on January 24, 2020, including Doc. No. 158 in Case No. 18cv1786. It is SO ORDERED. (anh) (Entered: 02/05/2020)	

	Availability	#	Date	Proceeding Text	Source
	Free	147	02/07/2020	RESPONSE in Opposition re 140 MOTION to Stay Renewed Motion to Stay Pending Inter Partes Review filed by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Afzal Dean, # 2 Declaration of Steven W. Hartsell, # 3 Exhibit 1, # 4 Exhibit 2, # 5 Exhibit 3, # 6 Exhibit 4)(Hartsell, Steven) (anh). (Entered: 02/07/2020)	

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Patents

Number	Title	Issued	Class	Subclass
7,319,889	System and method for conserving battery power in a mobile station	01/15/2008	455	574
8,204,554	System and method for conserving battery power in a mobile station	06/19/2012	455	574
7,990,842	Backward-compatible long training sequences for wireless communication networks	08/02/2011	370	208
6,941,156	Automatic handoff for wireless piconet multimode cell phone	09/06/2005	455	553.1
8,792,432	Prioritizing RACH message contents	07/29/2014	370	329
7,113,811	System and method for conserving battery power in a mobile station	09/26/2006	455	574
7,646,703	Backward-compatible long training sequences for wireless communication networks	01/12/2010	370	208
6,845,238	Inter-frequency measurement and handover for wireless communications	01/18/2005	455	436

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US District Court for the Southern District of California

(San Diego)

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Header

Case Number: 3:18cv1785
Date Filed: 08/01/2018
Assigned To: Judge Cathy Ann Bencivengo
Referred To: Magistrate Judge Barbara Lynn Major
Nature of Suit: Patent (830)
Cause: Patent Infringement
Lead Docket: None
Other Docket: None
Jurisdiction: Federal Question

Class Code: Closed
Closed: 08/05/2019
Statute: 35:0271
Jury Demand: Both
Demand Amount: $0
NOS Description: Patent

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Bell Northern Research, LLC	Alexander E. Gasser

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Proceedings

Retrieve Document(s)

	Availability	#	Date	Proceeding Text	Source
	Free	1	08/01/2018	COMPLAINT with Jury Demand against Kyocera Corporation, Kyocera International Inc. (Filing fee $ 400 receipt number 0974-11515122). Filed by Bell Northern Research, LLC. (Attachments: # 1 Civil Cover Sheet, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E, # 7 Exhibit F)The new case number is 3:18-cv-1785-WQH-BLM. Judge William Q. Hayes and Magistrate Judge Barbara Lynn Major are assigned to the case. (Malmberg, Mieke)(sjt) (dsn) (Entered: 08/02/2018)	
	Free	2	08/01/2018	REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,319,889*, *8,204,554*, ***7,990,842***, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (sjt) (dsn) (Entered: 08/02/2018)	
	Free	3	08/02/2018	Summons issued. Counsel receiving this notice electronically should print this summons and serve it in accordance with Rule 4, Fed.R.Civ.P and LR 4.1. (sjt) (dsn) (Entered: 08/02/2018)	
	Free	4	08/02/2018	NOTICE of Party With Financial Interest by Bell Northern Research, LLC . Identifying Corporate Parent Hilco **Patent** Acquisition 56, LLC, Corporate Parent Hilco IP Merchant Capital, LLC, Corporate Parent Hilco, Inc. for Bell Northern Research, LLC. (Malmberg, Mieke) (ajs) (jao). (Entered: 08/02/2018)	
	Free	5	08/02/2018	NOTICE of Appearance by Mieke Katherine Malmberg on behalf of Bell Northern Research, LLC (Malmberg, Mieke) (ajs). (Entered: 08/02/2018)	
	Free	6	08/06/2018	NOTICE OF RELATED CASE(S) by Bell Northern Research, LLC of case(s) 3:18-cv-1783, 3:18-cv-1784, 3:18-cv-1786 . (Malmberg, Mieke) (ajs). (Entered: 08/06/2018)	
	Free	7	08/07/2018	SUMMONS Returned Executed by Bell Northern Research, LLC. Kyocera International Inc. served. (Malmberg, Mieke)(ajs). (Entered: 08/07/2018)	

	Availability	#	Date	Proceeding Text	Source
	Runner	8	08/14/2018	MINUTE ORDER. Judge William Q. Hayes has declined assignment pursuant to General Order 598. Case reassigned to Judge Dana M. Sabraw for all further proceedings. The new case number is 18cv1785 DMS (BLM).(no document attached) (jcj) (Entered: 08/14/2018)	
	Free	9	08/22/2018	Joint MOTION for Extension of Time to File Answer re 1 Complaint, by Kyocera International Inc.. (Woodmansee, Mark Andrew)Attorney Mark Andrew Woodmansee added to party Kyocera International Inc.(pty:dft) (aef). (Entered: 08/22/2018)	
	Free	10	08/23/2018	ORDER Granting 9 Joint Motion for Extension of Time for Kyocera International Inc. to Respond to Plaintiff's Complaint. KII has until September 24, 2018 to file and serve an answer or otherwise respond to Plaintiff's complaint. Signed by Judge Dana M. Sabraw on 8/23/2018. (aef) (Entered: 08/23/2018)	
	Free	11	08/29/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11616519.) (Application to be reviewed by Clerk.) (Blackman, Marc) (mdc) (Entered: 08/29/2018)	
	Free	12	08/29/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11616574.) (Application to be reviewed by Clerk.) (Witcoff, David) (mdc) (Entered: 08/29/2018)	
	Runner	13	08/30/2018	PRO HAC APPROVED re 11 : Marc S. Blackman appearing for Defendant Kyocera International Inc. (no document attached) (mdc) (Entered: 08/30/2018)	
	Runner	14	08/30/2018	PRO HAC APPROVED re 12 : David Lawrence Witcoff appearing for Defendant Kyocera International Inc. (no document attached) (mdc) (Entered: 08/30/2018)	
	Free	15	09/17/2018	ORDER OF TRANSFER PURSUANT TO LOW NUMBER RULE. Case reassigned to Judge Cathy Ann Bencivengo and Magistrate Judge Barbara Lynn Major for all further proceedings. Judge Dana M. Sabraw and Magistrate Judge Barbara Lynn Major no longer assigned to case. Create association to 3:18-cv-01783-CAB-BLM. The new case number is 18cv1785-CAB-BLM. Signed by Judge Cathy Ann Bencivengo on 9/13/2018. Signed by Judge Dana M. Sabraw on 9/14/2018.(aef) (Entered: 09/17/2018)	
	Free	16	09/24/2018	Joint MOTION for Extension of Time to File Answer re 1 Complaint, by Bell Northern Research, LLC. (Malmberg, Mieke) (aef). (Entered: 09/24/2018)	
	Free	17	09/24/2018	ORDER Granting 16 Joint Motion for Extension of Time for Kyocera International Inc. to Respond to Plaintiff's Complaint. Signed by Judge Cathy Ann Bencivengo on 9/24/2018. (aef) (Entered: 09/24/2018)	
	Free	18	09/24/2018	Minute Order: It is hereby ORDERED that a case management conference in the above-referenced cases will take place on October 22, 2018 at 2:30 p.m. before Judge Bencivengo in Courtroom 4C.(aef) (Entered: 09/24/2018)	

	Availability	#	Date	Proceeding Text	Source
	Free	19	10/04/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11756007.)(Application to be reviewed by Clerk.)(Skiermont, Paul)(jrd) (Entered: 10/04/2018)	
	Free	20	10/04/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11756056.)(Application to be reviewed by Clerk.)(Abdullah, Sadaf)(jrd) (Entered: 10/04/2018)	
	Free	21	10/04/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11756091.)(Application to be reviewed by Clerk.)(Hartsell, Steven)(jrd) (Entered: 10/04/2018)	
	Free	22	10/05/2018	ANSWER to 1 Complaint, with Jury Demand , COUNTERCLAIM against Bell Northern Research, LLC by Kyocera International Inc..(Woodmansee, Mark Andrew) (anh). (Entered: 10/05/2018)	
	Free	23	10/05/2018	NOTICE of Party With Financial Interest by Kyocera International Inc. . Identifying Corporate Parent Kyocera Corporation for Kyocera International Inc., Kyocera International Inc. (Woodmansee, Mark Andrew) (anh). (jao). (Entered: 10/05/2018)	
	Free	24	10/09/2018	ORDER Finding Early Neutral Evaluation Conference Inappropriate. Signed by Magistrate Judge Barbara Lynn Major on 10/9/2018.(anh) (Entered: 10/09/2018)	
	Free	25	10/09/2018	ORDER Approving the Pro Hac Vice Application of Paul J. Skiermont, re 19 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 10/5/2018. (mdc) (Entered: 10/09/2018)	
	Free	26	10/09/2018	ORDER Approving the Pro Hac Vice Application of Sadaf R. Abdullah, re 20 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 10/5/2018. (mdc) (Entered: 10/09/2018)	
	Free	27	10/09/2018	ORDER Approving the Pro Hac Vice Application of Steven W. Hartsell, re 21 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 10/5/2018. (mdc) (Entered: 10/09/2018)	
	Free	28	10/15/2018	REPORT of Rule 26(f) Planning Meeting. (Abdullah, Sadaf) (anh). (Entered: 10/15/2018)	
	Runner	29	10/22/2018	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Case Management Conference held on 10/22/2018.(Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf R. Abdullah and Mieke K. Malmberg). (Defendant Attorney David L. Witcoff and Mark A. Woodmansee). (no document attached) (lmh) (Entered: 10/22/2018)	
	Free	30	10/23/2018	Case Management Order Regulating Discovery and Other Pretrial Proceedings in a **Patent** Case. Signed by Magistrate Judge Barbara Lynn Major on 10/23/2018. (anh) (Entered: 10/23/2018)	
	Free	31	10/26/2018	AMENDED COMPLAINT with Jury Demand against Kyocera Corporation, Kyocera International Inc., filed by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Exhibit F) (Abdullah, Sadaf) (anh). (Entered: 10/26/2018)	

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	Availability	#	Date	Proceeding Text	Source
	Free	32	10/26/2018	REPLY - Other re 22 Answer to Complaint, Counterclaim filed by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered: 10/26/2018)	
	Free	33	10/30/2018	MOTION for Alternative Service by Bell Northern Research, LLC. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of P. Skiermont, # 3 Exhibit 1, # 4 Declaration of S. Abdullah, # 5 Exhibit 2, # 6 Exhibit 3, # 7 Declaration of A. Dean)(Malmberg, Mieke) (anh). (Entered: 10/30/2018)	
	Free	34	11/02/2018	ORDER Setting Briefing Schedule for Motion for Alternative Service. Signed by Judge Cathy Ann Bencivengo on 11/2/2018.(anh) (Entered: 11/02/2018)	
	Free	35	11/08/2018	RESPONSE in Opposition re 33 MOTION for Alternative Service with special appearance filed by Kyocera Corporation. (Attachments: # 1 Declaration of David L. Witcoff in Support of Opposition)(Woodmansee, Mark Andrew) (anh). (Entered: 11/08/2018)	
	Free	36	11/09/2018	ANSWER to 31 Amended Complaint, , COUNTERCLAIM against Bell Northern Research, LLC by Kyocera International Inc. (Woodmansee, Mark Andrew) (anh). (Entered: 11/09/2018)	
	Free	37	11/13/2018	REPLY to Response to Motion re 33 MOTION for Alternative Service filed by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered: 11/13/2018)	
	Free	38	11/16/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11910697.) (Application to be reviewed by Clerk.) (Hodge, Christopher) (mdc) (Entered: 11/16/2018)	
	Free	39	11/20/2018	ORDER Granting Motion for Alternative Service on Defendant Kyocera Corporation [Doc. No. 33]. Signed by Judge Cathy Ann Bencivengo on 11/20/2018. (anh) (Entered: 11/20/2018)	
	Free	40	11/20/2018	ORDER Approving the Pro Hac Vice Application of Christopher M. Hodge (Re: Doc. No. 38 Request to Appear Pro Hac Vice). Signed by Judge Cathy Ann Bencivengo on 11/19/2018.(jrd) (Entered: 11/20/2018)	
	Free	41	11/21/2018	REPLY - Other re 36 Answer to Amended Complaint, Counterclaim filed by Bell Northern Research, LLC. (Abdullah, Sadaf)(acc). (Entered: 11/21/2018)	
	Free	42	11/30/2018	Joint MOTION for Protective Order , Joint MOTION for Production of Electronically Stored Information (ESI) by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A - Proposed Protective Order, # 2 Exhibit B - Proposed Order Governing Discovery of Electronically-Stored Information)(Abdullah, Sadaf) QC Email: Proposed Order (anh). (Entered: 11/30/2018)	
	Free	43	12/05/2018	ORDER Granting 42 Joint Motion for Entry of Protective Order and ESI Order with Modifications. Signed by Magistrate Judge Barbara Lynn Major on 12/5/2018. (rmc) (Entered: 12/05/2018)	
	Free	44	12/11/2018	ANSWER to 31 Amended Complaint, by Kyocera Corporation.(Woodmansee, Mark Andrew)Attorney Mark Andrew Woodmansee added to party Kyocera Corporation(pty:dft) (anh). (Entered: 12/11/2018)	

	Availability	#	Date	Proceeding Text	Source
	Free	45	12/11/2018	Corporate Disclosure Statement by Kyocera Corporation. No Corporate Parents/Interested Parties. (Woodmansee, Mark Andrew) (anh). (jao). (Entered: 12/11/2018)	
	Free	46	01/02/2019	NOTICE OF RELATED CASE(S) by Bell Northern Research, LLC of case(s) 3:18-cv-2864 . (Malmberg, Mieke) (anh). (Entered: 01/02/2019)	
	Free	47	02/05/2019	MOTION to Clarify Case Management Order (Unopposed), MOTION to Consolidate Cases (Unopposed) by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered: 02/05/2019)	
	Free	48	02/08/2019	ORDER Granting Unopposed Motion for Clarification of the CMO and Consolidation for Pre-Trial [Doc. No. 47].. Signed by Judge Cathy Ann Bencivengo on 2/8/2019. (anh) (Entered: 02/11/2019)	
	Free	49	03/20/2019	MOTION for Leave to File First Amended Answers by Kyocera Corporation, Kyocera International Inc.. (Attachments: # 1 Memo of Points and Authorities, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4, # 6 Proof of Service)(Woodmansee, Mark Andrew) (anh). (Entered: 03/20/2019)	
	Free	50	03/21/2019	ORDER Granting Kyocera's Unopposed Motion for Leave to File First Amended Answers [Doc. No. 49]. Signed by Judge Cathy Ann Bencivengo on 3/21/2019. (anh) (Entered: 03/21/2019)	
	Free	51	03/22/2019	AMENDED ANSWER to 31 Amended Complaint, by Kyocera Corporation. (Woodmansee, Mark Andrew) (anh). (Entered: 03/22/2019)	
	Free	52	03/22/2019	AMENDED ANSWER to 31 Amended Complaint, by Kyocera International Inc.. (Woodmansee, Mark Andrew) (anh). (Entered: 03/22/2019)	
	Free	53	04/02/2019	REPLY - Other re 52 Amended Answer to Complaint filed by Bell Northern Research, LLC. (Hodge, Christopher) (anh). (Entered: 04/02/2019)	
	Free	54	04/12/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12400207.) (Application to be reviewed by Clerk) (Gasser, Alexander) (mdc) (Entered: 04/12/2019)	
	Free	55	04/15/2019	ORDER Approving the Pro Hac Vice Application of Alexander E. Gasser, re 54 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 4/15/2019.(dsn) (Entered: 04/16/2019)	
	Free	56	04/19/2019	JOINT HEARING STATEMENT by Bell Northern Research, LLC. (Attachments: # 1 Appendix A - Joint Claim Construction Worksheet, # 2 Appendix B - Joint Claim Construction Chart)(Abdullah, Sadaf) (anh). (Entered: 04/19/2019)	
	Runner	57	04/26/2019	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Status Hearing re Claim Construction held on 4/26/2019. Claim Construction Hearing confirmed for 6/19/2019 09:00 AM in Courtroom 4C before Judge Cathy Ann Bencivengo. (Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Abdullah and Steven Hartsell). (Defendant Attorney David Witcoff). (no document attached) (lmh) (Entered: 04/29/2019)	

	Availability	#	Date	Proceeding Text	Source
	Online	58	05/06/2019	NOTICE OF FILING OF OFFICIAL TRANSCRIPT of Proceedings held on 4/26/2019 before Judge Cathy Ann Bencivengo. Court Reporter/Transcriber: Mauralee Ramirez. Transcript may be viewed at the court public terminal or purchased through the Court Reporter/Transcriber before the deadline for Release of Transcript Restriction. After that date it may be obtained through PACER or the Court Reporter/Transcriber. If redaction is necessary, parties have seven calendar days from the file date of the Transcript to E-File the Notice of Intent to Request Redaction. The following deadlines would also apply if requesting redaction: Redaction Request Statement due to Court Reporter/Transcriber 5/28/2019. Redacted Transcript Deadline set for 6/6/2019. Release of Transcript Restriction set for 8/5/2019. (Transcript filed in case numbers 3:18-cv-01783-CAB-BLM, 3:18-cv-01784-CAB-BLM, 3:18-cv-01785-CAB-BLM,3:18-cv-01786-CAB-BLM, and 3:18-cv-02864-CAB-BLM.) (akr) (Entered: 05/06/2019)	
	Free	59	05/13/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12504873.) (Application to be reviewed by Clerk.) (Udick, Steven) (mdc) (Entered: 05/13/2019)	
	Free	60	05/13/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12506136) (Application to be reviewed by Clerk.) (Ritchie, Thomas) (mdc) (Entered: 05/13/2019)	
	Runner	61	05/14/2019	PRO HAC APPROVED re 60 : Thomas Ritchie appearing for Defendants Kyocera Corporation, Kyocera International Inc., Counter Claimants Kyocera International Inc., Kyocera International Inc. (no document attached) (mdc) (Entered: 05/14/2019)	
	Free	62	05/16/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12518043.) (Application to be reviewed by Clerk.) (White, Jeffrey) (mdc) (Entered: 05/16/2019)	
	Runner	63	05/16/2019	PRO HAC APPROVED re 62 : Jeffrey White appearing for Defendants Kyocera Corporation, Kyocera International Inc , Counter Claimants Kyocera International Inc., Kyocera International Inc. (no document attached) (mdc) (Entered: 05/16/2019)	
	Free	64	05/17/2019	ORDER Approving the Pro Hac Vice Application of Steven J. Udick, re 59 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 5/16/2019. (mdc) (Entered: 05/17/2019)	
	Free	65	05/24/2019	Joint MOTION for Summary Judgment on Indefiniteness by Kyocera Corporation, Kyocera International Inc.. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration, # 3 Exhibit A, # 4 Exhibit B, # 5 Exhibit C, # 6 Exhibit D, # 7 Exhibit E1, # 8 Exhibit E2, # 9 Exhibit F, # 10 Exhibit G, # 11 Exhibit H)(Ritchie, Thomas) (anh). (Entered: 05/24/2019)	

	Availability	#	Date	Proceeding Text	Source
	Free	66	05/24/2019	CLAIM CONSTRUCTION BRIEF by Kyocera Corporation, Kyocera International Inc.. (Attachments: # 1 Declaration, # 2 Exhibit A1, # 3 Exhibit A2, # 4 Exhibit A3, # 5 Exhibit B, # 6 Exhibit C1, # 7 Exhibit C2, # 8 Exhibit D, # 9 Exhibit E, # 10 Exhibit F, # 11 Exhibit G, # 12 Exhibit H, # 13 Exhibit I, # 14 Exhibit J, # 15 Exhibit K, # 16 Exhibit L) (Ritchie, Thomas) (anh). (Entered: 05/24/2019)	
	Free	67	05/24/2019	CLAIM CONSTRUCTION BRIEF by Bell Northern Research, LLC. (Attachments: # 1 Declaration of S. Abdullah, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E, # 7 Exhibit F, # 8 Exhibit G, # 9 Exhibit H, # 10 Exhibit I, # 11 Exhibit J, # 12 Exhibit K, # 13 Exhibit L, # 14 Exhibit M, # 15 Exhibit N, # 16 Exhibit O, # 17 Exhibit P, # 18 Exhibit Q, # 19 Exhibit R, # 20 Exhibit S, # 21 Exhibit T, # 22 Exhibit U, # 23 Exhibit V, # 24 Exhibit W)(Abdullah, Sadaf) (anh). (Entered: 05/24/2019)	
	Free	68	06/06/2019	Joint MOTION to Stay Case Deadlines as to Kyocera Defendants by Kyocera Corporation, Kyocera International Inc.. (Woodmansee, Mark Andrew) (anh). (Entered: 06/06/2019)	
	Free	69	06/06/2019	ORDER granting Joint Motion to Stay Case Deadlines as To Kyocera Defendants. Signed by Judge Cathy Ann Bencivengo on 6/6/2019. (anh) (Entered: 06/06/2019)	
	Runner	70	06/19/2019	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Claims Construction Hearing held on 6/19/2019 and continued to 6/20/2019 09:00 AM in Courtroom 4C before Judge Cathy Ann Bencivengo. (Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Raja Abdullah, Steven Hartsell and Paul Skiermont). (no document attached) (lmh) (Entered: 06/20/2019)	
	Runner	71	06/20/2019	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Claims Construction Hearing held and completed on 6/20/2019. Court to issue written Claims Construction Order.(Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Raja Abdullah, Steven Hartsell and Paul Skiermont). (no document attached) (lmh) (Entered: 06/21/2019)	
	Online	72	07/08/2019	Joint MOTION to Extend Stay as to Kyocera Defendants re 69 Order on Motion to Stay by Kyocera Corporation, Kyocera International Inc.. (Woodmansee, Mark Andrew) (anh). (Entered: 07/08/2019)	
	Free	73	07/09/2019	ORDER Granting Joint Motion to Extend Stay as to Kyocera Defendants [Doc. No. 72]. Signed by Judge Cathy Ann Bencivengo on 7/9/2019. (anh) (Entered: 07/09/2019)	
	Free	74	08/05/2019	Joint MOTION to Dismiss by Bell Northern Research, LLC. (Skiermont, Paul) (anh). (Entered: 08/05/2019)	
	Free	75	08/05/2019	ORDER Granting Joint Motion to Dismiss [Doc. No. 74]. Signed by Judge Cathy Ann Bencivengo on 8/5/2019. (anh) (sjt). (Entered: 08/05/2019)	

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Patents

Number	Title	Issued	Class	Subclass
7,319,689	System and method for conserving battery power in a mobile station	01/15/2008	455	574
8,204,554	System and method for conserving battery power in a mobile station	06/19/2012	455	574
7,990,842	Backward-compatible long training sequences for wireless communication networks	08/02/2011	370	208
8,416,862	Efficient feedback of channel information in a closed loop beamforming wireless communication system	04/09/2013	375	260
6,941,156	Automatic handoff for wireless piconet multimode cell phone	09/06/2005	455	553.1
8,792,432	Prioritizing RACH message contents	07/29/2014	370	329
7,113,811	System and method for conserving battery power in a mobile station	09/26/2006	455	574
7,646,703	Backward-compatible long training sequences for wireless communication networks	01/12/2010	370	208
6,845,238	Inter-frequency measurement and handover for wireless communications	01/18/2005	455	436
7,738,583	Reduced feedback for beamforming in a wireless communication	06/15/2010	375	267

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Header

Case Number: 3:18cv1786
Date Filed: 08/01/2018
Assigned To: Judge Cathy Ann Bencivengo
Referred To: Magistrate Judge Barbara Lynn Major
Nature of Suit: Patent (830)
Cause: Patent Infringement
Lead Docket: None
Other Docket: 3:18cv01783
Jurisdiction: Federal Question

Class Code: Open
Statute: 35:0271
Jury Demand: Plaintiff
Demand Amount: $0
NOS Description: Patent

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Proceedings

Retrieve Document(s)

	Availability	#	Date	Proceeding Text	Source
	Free	1	08/01/2018	COMPLAINT with Jury Demand against ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation (Filing fee $ 400 receipt number 0974-11515127.), filed by Bell Northern Research, LLC. (Attachments: # 1 Civil Cover Sheet, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E, # 7 Exhibit F)The new case number is 3:18-cv-1786-MMA-WVG. Judge Michael M. Anello and Magistrate Judge William V. Gallo are assigned to the case. (Maimberg, Mieke)(tcf) (sjt). (Entered: 08/02/2018)	
	Free	2	08/02/2018	REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,319,889*, *8,204,554*, ***7,996,842***, *8,416,862*, *6,941,156*, *8,792,432* cc:USPTO (tcf) (Entered: 08/02/2018)	
	Free	3	08/02/2018	Summons issued. Counsel receiving this notice electronically should print this summons and serve it in accordance with Rule 4, Fed.R.Civ.P and LR 4.1. (tcf) (Entered: 08/02/2018)	

	Availability	#	Date	Proceeding Text	Source
	Runner	4	08/02/2018	MINUTE ORDER. Judge Michael M. Anello has declined assignment pursuant to General Order 598. Case reassigned to Judge Janis L. Sammartino for all further proceedings. The new case number is 18cv1786 JLS (WVG).(no document attached) (jcj) (Entered: 08/02/2018)	
	Free	5	08/02/2018	NOTICE of Party With Financial Interest by Bell Northern Research, LLC . Identifying Corporate Parent Hilco **Patent** Acquisition 56, LLC, Corporate Parent Hilco IP Merchant Capital, LLC, Corporate Parent Hilco, Inc. for Bell Northern Research, LLC. (Malmberg, Mieke) (mpl). (jao). (Entered: 08/02/2018)	
	Free	6	08/02/2018	NOTICE of Appearance by Mieke Katherine Malmberg on behalf of Bell Northern Research, LLC (Malmberg, Mieke) (mpl). (Entered: 08/02/2018)	
	Free	7	08/06/2018	NOTICE OF RELATED CASE(S) by Bell Northern Research, LLC of case(s) 3:18-cv-1783, 3:18-cv-1784, 3:18-cv-1785 . (Malmberg, Mieke) (mpl). (Entered: 08/06/2018)	
	Free	8	08/08/2018	SUMMONS Returned Executed by Bell Northern Research, LLC. ZTE (TX), Inc. served. (Malmberg, Mieke) (mpl). (Entered: 08/08/2018)	
	Free	9	08/08/2018	SUMMONS Returned Executed by Bell Northern Research, LLC. ZTE (USA) Inc. served. (Malmberg, Mieke) (mpl). (Entered: 08/08/2018)	
	Free	10	08/23/2018	MOTION for Extension of Time to File Answer by Bell Northern Research, LLC. (Malmberg, Mieke)(mpl). (Entered: 08/23/2018)	
	Free	11	08/23/2018	ORDER OF TRANSFER PURSUANT TO LOW NUMBER RULE. Case reassigned to Judge Cathy Ann Bencivengo and Magistrate Judge Barbara Lynn Major for all further proceedings. Judge Janis L. Sammartino, Magistrate Judge William V. Gallo no longer assigned to case. Pending hearings previously set before the original Judge(s) have been transferred to the newly assigned Judge(s). Create association to 3:18-cv-01783-CAB-BLM. The new case number is 18cv1786-CAB-BLM. Signed by Judge Janis L. Sammartino on 8/23/2018. Signed by Judge Cynthia Bashant on 8/20/2018. (mpl) (Entered: 08/24/2018)	
	Free	12	08/27/2018	ORDER granting 10 Motion for Extension of Time for ZTE (USA) Inc. and ZTE (TX), Inc. to respond to plaintiff's complaint. ZTE (TX), Inc. and ZTE (USA) Inc. response due on or before 9/24/2018. Signed by Judge Cathy Ann Bencivengo on 8/27/2018. (jpp) (Entered: 08/27/2018)	
	Free	13	09/24/2018	NOTICE of Appearance by Inge Larish on behalf of ZTE (TX), Inc., ZTE (USA) Inc. (Larish, Inge)Attorney Inge Larish added to party ZTE (TX), Inc.(pty:dft), Attorney Inge Larish added to party ZTE (USA) Inc.(pty:dft) (aef). (Entered: 09/24/2018)	
	Free	14	09/24/2018	ANSWER to 1 Complaint, with Jury Demand , COUNTERCLAIM against Bell Northern Research, LLC by ZTE (USA) Inc..(Larish, Inge) (aef). (Entered: 09/24/2018)	

	Availability	#	Date	Proceeding Text	Source
	Free	15	09/24/2018	Corporate Disclosure Statement by ZTE (USA) Inc. identifying Corporate Parent ZTE Corporation, Corporate Parent HKSCC Nominees Limited, Corporate Parent Shenzhen Zhongxingxin Telecommunications Equipment Company limited for ZTE (USA) Inc., ZTE (USA) Inc. (Larish, Inge) (aef). (jao). (Entered: 09/24/2018)	
	Free	16	09/24/2018	ANSWER to 1 Complaint, with Jury Demand, by ZTE (TX), Inc..(Larish, Inge). Modified on 9/24/2018 to replace image, nef resent (jpp). (aef). (Entered: 09/24/2018)	
	Free	17	09/24/2018	Corporate Disclosure Statement by ZTE (TX), Inc. identifying Corporate Parent ZTE Corporation, Corporate Parent HKSCC Nominees Limited, Corporate Parent Shenzhen Zhongxingxin Telecommunications Equipment Company limited, Corporate Parent ZTE Hong Kong Ltd for ZTE (TX), Inc., ZTE (TX), Inc. (Larish, Inge) (aef). (jao). (Entered: 09/24/2018)	
	Free	18	09/24/2018	Minute Order: It is hereby ORDERED that a case management conference in the above-referenced cases will take place on October 22, 2018 at 2.30 p.m. before Judge Bencivengo in Courtroom 4C.(aef) (Entered: 09/24/2018)	
	Free	19	09/25/2018	ORDER Finding Early Neutral Evaluation Conference Inappropriate. Signed by Magistrate Judge Barbara Lynn Major on 9/25/2018.(jdt) (Entered: 09/25/2018)	
	Free	20	10/02/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11744757.)(Application to be reviewed by Clerk.) (Taylor, Keana)(jrd) (Entered: 10/02/2018)	
	Free	21	10/02/2018	NOTICE of Appearance of Counsel by Timothy Alan Horton on behalf of ZTE (TX), Inc., ZTE (USA) Inc. (Horton, Timothy)Attorney Timothy Alan Horton added to party ZTE (TX), Inc.(pty:cc), Attorney Timothy Alan Horton added to party ZTE (TX), Inc.(pty:dft), Attorney Timothy Alan Horton added to party ZTE (USA) Inc.(pty:dft), Attorney Timothy Alan Horton added to party ZTE (USA) Inc.(pty:cc) (anh). (Entered: 10/02/2018)	
	Free	22	10/02/2018	NOTICE of Change of Counsel Within Firm by ZTE (TX), Inc., ZTE (USA) Inc. re 13 Notice of Appearance (Horton, Timothy) (anh). (Entered: 10/02/2018)	
	Runner	23	10/02/2018	PRO HAC APPROVED: Keana Theresa Taylor appearing for Counter Claimants ZTE (TX), Inc., ZTE (USA) Inc., Defendants ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation (no document attached) (jrd) (Entered: 10/02/2018)	
	Free	24	10/04/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11756018.)(Application to be reviewed by Clerk.)(Skiermont, Paul)(jrd) (Entered: 10/04/2018)	
	Free	25	10/04/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11756067.)(Application to be reviewed by Clerk.)(Abdullah, Sadaf)(jrd) (Entered: 10/04/2018)	

	Availability	#	Date	Proceeding Text	Source
	Free	26	10/04/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11756104.)(Application to be reviewed by Clerk.)(Hartsell, Steven)(jrd) (Entered: 10/04/2018)	
	Free	27	10/09/2018	ORDER Approving the Pro Hac Vice Application of Paul J. Skiermont, re 24 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 10/5/2018. (mdc) (Entered: 10/09/2018)	
	Free	28	10/09/2018	ORDER Approving the Pro Hac Vice Application of Sadaf R. Abdullah, re 25 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 10/5/2018. (mdc) (Entered: 10/09/2018)	
	Free	29	10/09/2018	ORDER Approving the Pro Hac Vice Application of Steven W. Hartsell, re 26 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 10/5/2018. (mdc) (Entered: 10/09/2018)	
	Free	30	10/15/2018	REPLY - Other re 14 Answer to Complaint, Counterclaim filed by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered: 10/15/2018)	
	Free	31	10/15/2018	REPLY - Other re 16 Answer to Complaint, Counterclaim filed by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered: 10/15/2018)	
	Free	32	10/15/2018	REPORT of Rule 26(f) Planning Meeting. (Abdullah, Sadaf) (anh). (Entered: 10/15/2018)	
	Free	33	10/15/2018	AMENDED COMPLAINT with Jury Demand against ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation, filed by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Exhibit F, # 7 Exhibit G, # 8 Exhibit H) (Abdullah, Sadaf) (anh). (Entered: 10/15/2018)	
	Free	34	10/18/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11803717.) (Application to be reviewed by Clerk.) (McMahon, Charles) (mdc) (Entered: 10/18/2018)	
	Free	35	10/18/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11803749.) (Application to be reviewed by Clerk.) (Jones, Brian) (mdc) (Entered: 10/18/2018)	
	Free	36	10/18/2018	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-11805279.) (Application to be reviewed by Clerk.) (Parikh, Amol) (mdc) (Entered: 10/18/2018)	
	Runner	37	10/19/2018	PRO HAC APPROVED re 34 : Charles Moran McMahon appearing for Counter Claimants ZTE (TX), Inc., ZTE (USA) Inc., Defendants ZTE (TX), Inc., ZTE (USA) Inc. (no document attached) (mdc) (Entered: 10/19/2018)	
	Runner	38	10/19/2018	PRO HAC APPROVED re 35 : Brian Andrew Jones appearing for Counter Claimants ZTE (TX), Inc., ZTE (USA) Inc., Defendants ZTE (TX), Inc., ZTE (USA) Inc. (no document attached) (mdc) (Entered: 10/19/2018)	
	Runner	39	10/19/2018	PRO HAC APPROVED re 36 : Amol Ajay Parikh appearing for Counter Claimants ZTE (TX), Inc., ZTE (USA) Inc., Defendants ZTE (TX), Inc., ZTE (USA) Inc. (no document attached) (mdc) (Entered: 10/19/2018)	

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	Availability	#	Date	Proceeding Text	Source
	Free	40	10/22/2018	Ex Parte MOTION to Withdraw as Attorney Upshaw PLLC by ZTE (TX), Inc., ZTE (USA) Inc.. (Attachments: # 1 Proposed Order)(Horton, Timothy) QC Email: Proposed Order (anh). (Entered: 10/22/2018)	
	Runner	41	10/22/2018	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Case Management Conference held on 10/22/2018. (Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf R. Abdullah and Mieke K. Malmberg). (Defendant Attorney Timothy A. Horton and Charles M. McMahon). (no document attached) (lmh) (Entered: 10/22/2018)	
	Free	42	10/23/2018	ORDER on Request for Approval of Withdrawal of Upshaw PLLC as Counsel for ZTE (USA) Inc. and ZTE (TX) Inc. Signed by Judge Cathy Ann Bencivengo on 10/23/2018. (anh) (Entered: 10/23/2018)	
	Free	43	10/23/2018	Case Management Order Regulating Discovery and Other Pretrial Proceedings in a **Patent** Case. Signed by Magistrate Judge Barbara Lynn Major on 10/23/2018. (anh) (Entered: 10/23/2018)	
	Free	44	10/29/2018	ZTE (USA) Inc.'s ANSWER to 33 Amended Complaint, , COUNTERCLAIM against Bell Northern Research, LLC by ZTE (USA) Inc..(Jones, Brian) (anh). (Entered: 10/29/2018)	
	Free	45	10/29/2018	ZTE (TX), Inc. ANSWER to 33 Amended Complaint, by ZTE (TX), Inc..(Jones, Brian)(anh). (Entered: 10/29/2018)	
	Free	46	10/30/2018	**DOCUMENT WITHDRAWN PER DOC. NO. 49 *** MOTION for Alternative Service by Bell Northern Research, LLC. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of P. Skiermont, # 3 Exhibit 1, # 4 Declaration of S. Abdullah, # 5 Declaration of A. Dean)(Malmberg, Mieke) (anh). Modified to withdraw on 11/9/2018 (anh). (Entered: 10/30/2018)	
	Free	47	11/02/2018	ORDER Setting Briefing Schedule for Motion for Alternative Service. Signed by Judge Cathy Ann Bencivengo on 11/2/2018.(anh) (Entered: 11/02/2018)	
	Free	48	11/02/2018	REPLY - Other re 44 Answer to Amended Complaint, Counterclaim filed by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered: 11/02/2018)	
	Free	49	11/06/2018	NOTICE of Withdrawal of Motion for Alternative Service by Bell Northern Research, LLC re 46 MOTION for Alternative Service (Abdullah, Sadaf) (anh). (Entered: 11/06/2018)	
	Free	50	11/16/2018	Request to Appear Pro Hac Vice (Filing fee received. $ 206 receipt number 0974-11910709.) (Application to be reviewed by Clerk.) (Hodge, Christopher) (mdc) (Entered: 11/16/2018)	
	Free	51	11/20/2018	ORDER Approving the Pro Hac Vice Application of Christopher M. Hodge (Re: Doc. No. 50 Request to Appear Pro Hac Vice). Signed by Judge Cathy Ann Bencivengo on 11/19/2018.(jrd) (Entered: 11/20/2018)	
	Free	52	11/29/2018	ANSWER to 33 Amended Complaint, , COUNTERCLAIM against Bell Northern Research, LLC by ZTE Corporation. (Parikh, Amol)Attorney Amol Ajay Parikh added to party ZTE Corporation(pty:dft) (anh). (Entered: 11/29/2018)	

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	Availability	#	Date	Proceeding Text	Source
	Free	53	11/29/2018	Corporate Disclosure Statement by ZTE Corporation identifying Other Affiliate HKSCC Nominees Limited, Other Affiliate Shenzhen Zhongxingxin Telecommunications Equipment Company limited for ZTE Corporation.. (Parikh, Amol) (anh). (jao). (Entered: 11/29/2018)	
	Free	54	11/30/2018	Joint MOTION for Protective Order , Joint MOTION for Production of Electronically Stored Information (ESI) by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A - Proposed Protective Order, # 2 Exhibit B - Proposed Order Governing Discovery of Electronically-Stored Information)(Abdullah, Sadaf) QC Email: Proposed Order (anh). (Entered: 11/30/2018)	
	Free	55	12/05/2018	ORDER Granting 54 Joint Motion for Entry of Protective Order and ESI Order with Modifications. Signed by Magistrate Judge Barbara Lynn Major on 12/5/2018. (rmc) (Entered: 12/05/2018)	
	Free	56	12/12/2018	REPLY - Other re 52 Answer to Amended Complaint, Counterclaim filed by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered: 12/12/2018)	
	Free	57	01/02/2019	NOTICE OF RELATED CASE(S) by Bell Northern Research, LLC of case(s) 3:18-cv-2864 . (Malmberg, Mieke) (anh). (Entered: 01/02/2019)	
	Free	58	02/05/2019	MOTION to Clarify Case Management Order (Unopposed), MOTION to Consolidate Cases (Unopposed) by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered: 02/05/2019)	
	Free	59	02/08/2019	MOTION for Protective Order by ZTE (TX), Inc., ZTE (USA) inc., ZTE Corporation. (Attachments: # 1 Memo of Points and Authorities in Support of Motion for Protective Order, # 2 Declaration of Charles M. McMahon, # 3 Exhibit Index, # 4 Exhibit A, # 5 Exhibit B, # 6 Exhibit C, # 7 Exhibit D, # 8 Exhibit E, # 9 Exhibit F, # 10 Exhibit G, # 11 Exhibit H, # 12 Exhibit I, # 13 Exhibit J, # 14 Exhibit K) (Parikh, Amol) (anh). (Entered: 02/08/2019)	
	Free	60	02/08/2019	ORDER Granting Unopposed Motion for Clarification of the CMO and Consolidation for Pre-Trial [Doc. No. 58].. Signed by Judge Cathy Ann Bencivengo on 2/8/2019. (anh) (Entered: 02/11/2019)	
	Free	61	02/11/2019	NOTICE Amended Notice of Motion by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation re 59 MOTION for Protective Order (Parikh, Amol) (anh). (Entered: 02/11/2019)	
	Free	62	02/11/2019	ORDER Setting Briefing Schedule for Defendants' Motion for Entry of Protective Order to Disqualify Plaintiff's Expert. Signed by Magistrate Judge Barbara Lynn Major on 2/11/2019.(anh) (Entered: 02/11/2019)	

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	Availability	#	Date	Proceeding Text	Source
	Free	63	02/22/2019	RESPONSE in Opposition re 59 MOTION for Protective Order filed by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Dr. Vijay K. Madisetti, # 2 Declaration of Steven W. Hartsell, # 3 Exhibit Table of Contents, # 4 Exhibit 1, # 5 Exhibit 2, # 6 Exhibit 3, # 7 Exhibit 4, # 8 Exhibit 5, # 9 Exhibit 6, # 10 Exhibit 7, # 11 Exhibit 8, # 12 Exhibit 9, # 13 Exhibit 10, # 14 Exhibit 11, # 15 Exhibit 12, # 16 Exhibit 13, # 17 Exhibit 14, # 18 Exhibit 15, # 19 Exhibit 16, # 20 Exhibit 17, # 21 Exhibit 18, # 22 Exhibit 19, # 23 Exhibit 20, # 24 Exhibit 21, # 25 Exhibit 22, # 26 Exhibit 23, # 27 Exhibit 24, # 28 Exhibit 25, # 29 Exhibit 26, # 30 Exhibit 27, # 31 Exhibit 28, # 32 Exhibit 29, # 33 Exhibit 30)(Hartsell, Steven) (anh). (Entered: 02/22/2019)	
	Free	64	03/01/2019	REPLY to Response to Motion re 59 MOTION for Protective Order filed by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Declaration of Amol Parikh, # 2 Exhibit Index, # 3 Exhibit L, # 4 Exhibit M) (Parikh, Amol) Modified to withdraw (anh). (anh). (Entered: 03/01/2019)	
	Free	65	03/01/2019	REPLY to Response to Motion re 59 MOTION for Protective Order filed by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Declaration Amol Parikh, # 2 Exhibit Index, # 3 Exhibit L, # 4 Exhibit M) (Parikh, Amol) (anh). (Entered: 03/01/2019)	
	Free	66	03/01/2019	MOTION to Withdraw 64 Reply to Response to Motion, by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Memo of Points and Authorities) (Parikh, Amol) (anh). (Entered: 03/01/2019)	
	Runner	67	03/04/2019	Order GRANTING Defendants ZTE (TX), Inc., ZTE (USA) Inc., and ZTE Corporation's 66 Motion to Withdraw Reply to Response to Motion, Document 64 . Document 64 is hereby withdrawn. Signed by Magistrate Judge Barbara Lynn Major on 03/04/2019. (no document attached) (bxr) (Entered: 03/04/2019)	
	Free	68	03/08/2019	**DOCUMENT WITHDRAWN PER NO. 71 ** MOTION to Strike Affirmative Defenses by Bell Northern Research, LLC. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of Sadaf Abdullah, # 3 Exhibit Index, # 4 Exhibit 1, # 5 Exhibit 2, # 6 Exhibit 3, # 7 Exhibit 4, # 8 Exhibit 5, # 9 Exhibit 6, # 10 Exhibit 7)(Abdullah, Sadaf) (anh). (Entered: 03/08/2019)	
	Free	69	03/20/2019	NOTICE of Appearance by Jiaxiao Zhang on behalf of ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation (Zhang, Jiaxiao)Attorney Jiaxiao Zhang added to party ZTE (TX), Inc (pty:dft), Attorney Jiaxiao Zhang added to party ZTE (USA) Inc.(pty:dft), Attorney Jiaxiao Zhang added to party ZTE (USA) Inc.(pty:cc), Attorney Jiaxiao Zhang added to party ZTE Corporation(pty:cc), Attorney Jiaxiao Zhang added to party ZTE Corporation(pty:dft) (anh). (Entered. 03/20/2019)	

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	Availability	#	Date	Proceeding Text	Source
	Free	70	03/29/2019	RESPONSE in Opposition re 68 MOTION to Strike Affirmative Defenses filed by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Statement of Facts Brief Statement, # 2 Declaration of Amol Parikh, # 3 Exhibit A, # 4 Exhibit B, # 5 Exhibit C, # 6 Exhibit D) (Parikh, Amol) (dlg). (Entered: 03/29/2019)	
	Free	71	04/05/2019	NOTICE of Withdrawal of Motion to Strike Affirmative Defenses by Bell Northern Research, LLC re 68 MOTION to Strike Affirmative Defenses (Abdullah, Sadaf) (anh). (Entered: 04/05/2019)	
	Free	72	04/12/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12400223.) (Application to be reviewed by Clerk) (Gasser, Alexander) (mdc) (Entered: 04/12/2019)	
	Free	73	04/12/2019	ORDER Granting Defendants' Motion for Protective Order Preventing Plaintiff From Using Dr. Vijay Madisetti as an Expert [Doc. No. 59 , 63 , 65]. Signed by Magistrate Judge Barbara Lynn Major on 4/12/2019. (anh) (Entered: 04/12/2019)	
	Free	74	04/15/2019	ORDER Approving the Pro Hac Vice Application of Alexander E. Gasser, re 72 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 4/15/2019.(dsn) (Entered: 04/16/2019)	
	Free	75	04/17/2019	MOTION to Clarify the Court's Order [Dkt. 73] Granting ZTE's Motion for Protective Order by Bell Northern Research, LLC. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of S. Hartsell, # 3 Exhibit 1, # 4 Exhibit 2, # 5 Exhibit 3)(Hartsell, Steven) (anh). (Entered: 04/17/2019)	
	Free	76	04/19/2019	RESPONSE in Opposition re 75 MOTION to Clarify the Court's Order [Dkt. 73] Granting ZTE's Motion for Protective Order filed by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Declaration of Amol A. Parikh, # 2 Exhibit Index, # 3 Exhibit A, # 4 Exhibit B, # 5 Exhibit C)(Parikh, Amol) (anh). (Entered: 04/19/2019)	
	Free	77	04/19/2019	NOTICE of Ex Parte Application for Telephonic Appearance by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation (McMahon, Charles)Attorney Charles Moran McMahon added to party ZTE Corporation(pty:dft) (anh). (Entered: 04/19/2019)	
	Free	78	04/19/2019	ORDER Granting ZTE's Ex Parte Application for Telephonic Appearance [Doc. No. 77]. Signed by Judge Cathy Ann Bencivengo on 4/19/2019.(anh) (Entered: 04/19/2019)	
	Free	79	04/19/2019	JOINT HEARING STATEMENT by Bell Northern Research, LLC. (Attachments: # 1 Appendix A - Joint Claim Construction Worksheet, # 2 Appendix B - Joint Claim Construction Chart)(Abdullah, Sadaf) (anh). (Entered: 04/19/2019)	
	Free	80	04/23/2019	REPLY to Response to Motion re 75 MOTION to Clarify the Court's Order [Dkt. 73] Granting ZTE's Motion for Protective Order filed by Bell Northern Research, LLC. (Attachments: # 1 Declaration of S. Abdullah, # 2 Exhibit 4, # 3 Exhibit 5)(Hartsell, Steven) (anh). (Entered: 04/23/2019)	

	Availability	#	Date	Proceeding Text	Source
	Runner	81	04/26/2019	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Status Hearing re Claim Construction held on 4/26/2019. Claim Construction Hearing confirmed for 6/19/2019 09:00 AM in Courtroom 4C before Judge Cathy Ann Bencivengo. (Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Abdullah and Steven Hartsell). (Defendant Attorney Charles McMahon (telephonic) and Jiaxiao Zhang). (no document attached) (lmh) (Entered: 04/29/2019)	
	Free	82	05/02/2019	ORDER Clarifying the April 12, 2019 Order Granting Defendants' Motion for Protective Order [ECF Nos. 75 , 76 , 80]. Signed by Magistrate Judge Barbara Lynn Major on 5/2/2019. (anh) (Entered: 05/03/2019)	
	Online	83	05/06/2019	NOTICE OF FILING OF OFFICIAL TRANSCRIPT of Proceedings held on 4/26/2019 before Judge Cathy Ann Bencivengo. Court Reporter/Transcriber: Mauralee Ramirez. Transcript may be viewed at the court public terminal or purchased through the Court Reporter/Transcriber before the deadline for Release of Transcript Restriction. After that date it may be obtained through PACER or the Court Reporter/Transcriber. If redaction is necessary, parties have seven calendar days from the file date of the Transcript to E-File the Notice of Intent to Request Redaction. The following deadlines would also apply if requesting redaction: Redaction Request Statement due to Court Reporter/Transcriber 5/28/2019. Redacted Transcript Deadline set for 6/6/2019. Release of Transcript Restriction set for 8/5/2019. (Transcript filed in case numbers 3:18-cv-01783-CAB-BLM, 3:18-cv-01784-CAB-BLM, 3:18-cv-01785-CAB-BLM,3:18-cv-01786-CAB-BLM, and 3:18-cv-02864-CAB-BLM.) (akr) (Entered: 05/06/2019)	
	Free	84	05/08/2019	MOTION to Strike Declaration(s) of Dr. Vijay K. Madisetti by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of Amol A. Parikh, # 3 Exhibit Index of Exhibits, # 4 Exhibit A, # 5 Exhibit B, # 6 Exhibit C, # 7 Exhibit D, # 8 Exhibit E, # 9 Exhibit F, # 10 Exhibit G, # 11 Exhibit I-I)(Parikh, Amol) (anh). (Entered: 05/08/2019)	
	Free	85	05/13/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12504878.) (Application to be reviewed by Clerk.) (Udick, Steven) (mdc) (Entered: 05/13/2019)	
	Free	86	05/24/2019	MOTION for Summary Judgment (Defendants' Notice of Motion and Motion in Support of Their Joint Motion for Summary Judgment on Indefiniteness) by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration, # 3 Exhibit, # 4 Exhibit, # 5 Exhibit, # 6 Exhibit, # 7 Exhibit, # 8 Exhibit, # 9 Exhibit, # 10 Exhibit)(Parikh, Amol) (anh). (Entered: 05/24/2019)	

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	Availability	#	Date	Proceeding Text	Source
	Free	87	05/24/2019	CLAIM CONSTRUCTION BRIEF by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Declaration, # 2 Exhibit A-1, # 3 Exhibit A-2, # 4 Exhibit A-3, # 5 Exhibit B, # 6 Exhibit C-1, # 7 Exhibit C-2, # 8 Exhibit D, # 9 Exhibit E, # 10 Exhibit F, # 11 Exhibit G, # 12 Exhibit H, # 13 Exhibit I, # 14 Exhibit J, # 15 Exhibit K, # 16 Exhibit L)(Parikh, Amol) (anh). (Entered: 05/24/2019)	
	Free	88	05/24/2019	CLAIM CONSTRUCTION BRIEF by Bell Northern Research, LLC. (Attachments: # 1 Declaration of S. Abdullah, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E, # 7 Exhibit F, # 8 Exhibit G, # 9 Exhibit H, # 10 Exhibit I, # 11 Exhibit J, # 12 Exhibit K, # 13 Exhibit L, # 14 Exhibit M, # 15 Exhibit N, # 16 Exhibit O, # 17 Exhibit P, # 18 Exhibit Q, # 19 Exhibit R, # 20 Exhibit S, # 21 Exhibit T, # 22 Exhibit U, # 23 Exhibit V, # 24 Exhibit W)(Abdullah, Sadaf) (anh). (Entered: 05/24/2019)	
	Free	89	05/29/2019	RESPONSE in Opposition re 84 MOTION to Strike Declaration(s) of Dr. Vijay K. Madisetti filed by Bell Northern Research, LLC. (Attachments: # 1 Declaration of S. Abdullah, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4, # 6 Exhibit 5, # 7 Exhibit 6, # 8 Exhibit 7, # 9 Exhibit 8, # 10 Exhibit 9, # 11 Exhibit 10)(Abdullah, Sadaf) (rmc). (Entered: 05/29/2019)	
	Free	90	06/04/2019	ORDER Approving the Pro Hac Vice Application of Steven J. Udick, re 85 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 6/4/2019. (mdc) (Entered: 06/04/2019)	
	Free	91	06/05/2019	REPLY to Response to Motion re 84 MOTION to Strike Declaration(s) of Dr. Vijay K. Madisetti filed by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Parikh, Amol) (anh). (Entered: 06/05/2019)	
	Online	92	06/07/2019	ORDER Granting ZTE's Motion to Strike Dr. Madisetti's Declaration [Doc. No. 84]. Signed by Judge Cathy Ann Bencivengo on 6/7/2019. (anh) (Entered: 06/07/2019)	
	Online	93	06/10/2019	**DOCUMENT WITHDRAWN PER DOC. NO 106 ** MOTION for Reconsideration re 92 Order on Motion to Strike Or, In the Alternative, A Continuance Or Severance by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A)(Abdullah, Sadaf) (anh). (anh). (Entered: 06/10/2019)	
	Free	94	06/12/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12608827.) (Application to be reviewed by Clerk.) (DaMario, Thomas) (mdc) (Entered: 06/12/2019)	
	Online	95	06/12/2019	SUPPLEMENTAL DOCUMENT by Bell Northern Research, LLC re 79 Joint Hearing Statement Supplemental Joint Hearing Statement. (Hartsell, Steven) (anh). (Entered: 06/12/2019)	
	Public	96	06/13/2019	PRO HAC APPROVED re 94 : Thomas DaMario appearing for Defendants ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation, Counter Claimants ZTE (USA) Inc., ZTE Corporation. (no document attached) (mdc) (Entered: 06/13/2019)	

Availability	#	Date	Proceeding Text	Source
Online	97	06/14/2019	RESPONSE TO CLAIM CONSTRUCTION BRIEF by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Declaration of James Young Hurt, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D) (Parikh, Amol) (anh). (Entered: 06/14/2019)	
Online	98	06/14/2019	RESPONSE TO CLAIM CONSTRUCTION BRIEF by Bell Northern Research, LLC. (Attachments: # 1 Declaration of S. Abdullah, # 2 Exhibit X, # 3 Exhibit Y, # 4 Exhibit Z, # 5 Exhibit AA)(Abdullah, Sadaf) (anh). (Entered: 06/14/2019)	
Online	99	06/14/2019	RESPONSE in Opposition re 86 MOTION for Summary Judgment (Defendants' Notice of Motion and Motion in Support of Their Joint Motion for Summary Judgment on Indefiniteness) filed by Bell Northern Research, LLC. (Attachments: # 1 Declaration of S. Abdullah, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4, # 6 Exhibit 5) (Abdullah, Sadaf) (anh). (Entered: 06/14/2019)	
Online	100	06/17/2019	MOTION to Allow the Use of Electrical Equipment in the Courtroom during Hearing Scheduled for June 19-20, 2019 by Bell Northern Research, LLC. (Hartsell, Steven) (anh). (Entered: 06/17/2019)	
Online	102	06/17/2019	ORDER Granting Plaintiff's Motion for Order Authorizing Use of Electronic Equipment in Courtroom for Claim Construction Hearing Scheduled for June 19-20, 2019. Signed by Judge Cathy Ann Bencivengo on 6/17/2019. (anh) (Entered: 06/18/2019)	
Online	101	06/18/2019	Joint MOTION to Allow the Use of Electrical Equipment in the Courtroom during Hearing scheduled for June 19-20, 2019 by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Parikh, Amol) (anh). (Entered: 06/18/2019)	
Online	103	06/18/2019	ORDER Granting Defendants' Joint Motion for Order Authorizing Use of Electronic Equipment in Courtroom for Claim Construction Hearing June 19-20, 2019. Signed by Judge Cathy Ann Bencivengo on 6/18/2019. (anh) (Entered: 06/18/2019)	
Runner	104	06/19/2019	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Claims Construction Hearing held on 6/19/2019 and continued to 6/20/2019 09:00 AM in Courtroom 4C before Judge Cathy Ann Bencivengo. (Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Raja Abdullah, Steven Hartsell and Paul Skiermont). (Defendant Attorney Thomas DaMario, Amol Parikh and Jiaxiao Zhang). (no document attached) (lmh) (Entered: 06/20/2019)	
Runner	105	06/20/2019	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Claims Construction Hearing held and completed on 6/20/2019. Court to issue written Claims Construction Order.(Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Raja Abdullah, Steven Hartsell and Paul Skiermont). (Defendant Attorney Thomas DaMario, Amol Parikh and Jiaxiao Zhang). (no document attached) (lmh) (Entered: 06/21/2019)	

	Availability	#	Date	Proceeding Text	Source
	Online	106	06/25/2019	NOTICE of Withdrawal of Motion for Reconsideration Or, In the Alternative, A Continuance Or Severance by Bell Northern Research, LLC re 93 MOTION for Reconsideration re 92 Order on Motion to Strike Or, In the Alternative, A Continuance Or Severance (Hartsell, Steven) (anh). (Entered: 06/25/2019)	
	Online	107	08/07/2019	NOTICE of filing Petitions for Inter Partes Review by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation (Parikh, Amol) (anh). (Entered: 08/07/2019)	
	Online	108	08/07/2019	MOTION to Stay ZTE's Motion for Joinder in Huawei Defendants' Motion to Stay Pending Inter Partes Review by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Memo of Points and Authorities in Support of Motion for Joinder to Huawei's Motion to Stay, # 2 Declaration of Amol A. Parikh, # 3 Exhibit A)(Parikh, Amol) (anh). (Entered: 08/07/2019)	
	Online	109	08/09/2019	Claim Construction ORDER and ORDER on Motions for Summary Judgment [Doc. Nos. 86 , 93]. Signed by Judge Cathy Ann Bencivengo on 8/9/2019. (anh) (Entered: 08/09/2019)	
	Online	110	08/12/2019	ORDER on Request for Pre-Institution Stay of the Litigation [Doc. No. 109]. Signed by Judge Cathy Ann Bencivengo on 8/12/2019. (anh) (Entered: 08/12/2019)	
	Free	111	08/21/2019	SCHEDULING ORDER Regulating Discovery and Other Pretrial Proceedings. Signed by Magistrate Judge Barbara Lynn Major on 08/21/2019.(mme) (Entered: 08/22/2019)	
	Online	112	08/26/2019	Joint MOTION to Amend/Correct 55 Order on Motion for Protective Order, Order on Motion for Production of Electronically Stored Information (ESI) by Bell Northern Research, LLC. (Attachments: # 1 Proposed Order) (Hartsell, Steven) (anh). (Entered: 08/26/2019)	
	Online	113	08/30/2019	ORDER Granting Joint Motion to Correct Protective Order [ECF No. 112]. Signed by Magistrate Judge Barbara Lynn Major on 8/30/2019. (anh) (Entered: 08/30/2019)	
	Free	114	09/04/2019	ORDER Setting Briefing Schedule for Plaintiffs Motion to Compel. Signed by Magistrate Judge Barbara Lynn Major on 9/4/2019.(anh) (Entered: 09/04/2019)	
	Online	115	09/05/2019	Joint MOTION for Protective Order [Motion for Stipulated Supplemental Protective Order] by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A)(Udick, Steven) (mxc). (Entered: 09/05/2019)	
	Online	116	09/06/2019	NOTICE of Appearance by Jaime Olin on behalf of Bell Northern Research, LLC (Olin, Jaime)Attorney Jaime Olin added to party Bell Northern Research, LLC(pty:pla) (anh). (Entered: 09/06/2019)	
	Online	117	09/09/2019	ORDER Granting Joint Motion for Entry of Protective Order Between Plaintiff, Defendants, and Non-Party Qualcomm Incorporated [ECF No. 115]. Signed by Magistrate Judge Barbara Lynn Major on 9/9/2019. (anh) (Entered: 09/09/2019)	
	Free	118	09/11/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12930442.)(Application to be reviewed by Clerk.)(Turner, Calli)(jrd) (Entered: 09/11/2019)	

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	Availability	#	Date	Proceeding Text	Source
	Runner	119	09/11/2019	PRO HAC APPROVED: Calli Turner appearing for Defendants ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation, Counter Claimants ZTE (USA) Inc., ZTE Corporation (no document attached) (jrd) (Entered: 09/11/2019)	
	Online	120	09/11/2019	MOTION to Compel ZTE Corporation, ZTE (USA) Inc., and ZTE (TX) Inc. by Bell Northern Research, LLC. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of Paul J. Skiermont, # 3 Declaration of Sadaf R. Abdullah, # 4 Declaration of Alexander E. Gasser, # 5 Declaration of Steven J. Udick, # 6 Exhibit 1, # 7 Exhibit 2, # 8 Exhibit 3, # 9 Exhibit 4, # 10 Exhibit 5, # 11 Exhibit 6)(Udick, Steven) (anh). (Entered: 09/11/2019)	
	Free	121	09/16/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12943412.)(Application to be reviewed by Clerk.)(Ott, Alexander)(jrd) (Entered: 09/16/2019)	
	Runner	122	09/16/2019	PRO HAC APPROVED: Alexander Ott appearing for Defendants ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation, Counter Claimants ZTE (USA) Inc., ZTE Corporation (no document attached) (jrd) (Entered: 09/16/2019)	
	Online	123	09/18/2019	RESPONSE in Opposition re 120 MOTION to Compel ZTE Corporation, ZTE (USA) Inc., and ZTE (TX) Inc. filed by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Declaration of Amol A. Parikh, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E, # 7 Exhibit F, # 8 Exhibit G, # 9 Exhibit H) (Parikh, Amol) (anh). (Entered: 09/18/2019)	
	Online	124	09/20/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12966719.)(Application to be reviewed by Clerk.)(Ramirez, Joseph)(jrd) (Entered: 09/20/2019)	
	Online	125	09/23/2019	ORDER Approving the Pro Hac Vice Application of Joseph M. Ramirez, re 124 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 9/20/2019. (mdc) (Entered: 09/24/2019)	
	Free	126	10/02/2019	Joint MOTION to Dismiss Counts 3 and 6 of the First Amended Complaint and Counts VI, VII, X, and XI of Defendants Counterclaims with Prejudice by Bell Northern Research, LLC. (Abdullah, Sadaf) (rmc). (Entered: 10/02/2019)	
	Free	127	10/04/2019	ORDER Granting Joint Motion for Dismissal as to Counts 3 and 6 of BNR's Amended Complaint and Counts VI, VII, X, and XI of ZTE(TX), Inc., and ZTE(USA) Inc.'s Counterclaims [Doc. No. 126]. Signed by Judge Cathy Ann Bencivengo on 10/4/2019. (anh) (Entered: 10/04/2019)	
	Online	128	10/11/2019	MOTION to Withdraw as Attorney Christopher M. Hodge by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Steven W. Hartsell in Support)(Hartsell, Steven) (anh). (Entered: 10/11/2019)	

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	Availability	#	Date	Proceeding Text	Source
	Online	129	10/11/2019	ORDER Granting Plaintiff's Notice of Motion and Motion to Withdraw Christopher Hodge as Counsel of Record. Signed by Judge Cathy Ann Bencivengo on 10/11/2019. (anh) (Entered: 10/11/2019)	
	Runner	130	10/23/2019	Minute Entry for proceedings held before Magistrate Judge Barbara Lynn Major: Mandatory Settlement Conference held on 10/23/2019. While partial settlement was reached, the parties were unable to settle the majority of the issues. The parties are ORDERED to jointly contact Judge Major's chambers on or before November 1, 2019 to inform the Court as to whether they have finalized a settlement agreement. (Plaintiff Attorney Sadaf Abdullah; Steven Hartsell; Mieke Malmberg). (Defendant Attorney Amol Parikh). (no document attached) (bxr) (Entered: 10/23/2019)	
	Free	131	10/24/2019	ORDER Granting In Part Plaintiff's Motion 120 And Denying Plaintiff's Request To Compel Email Discovery. Signed by Magistrate Judge Barbara Lynn Major on 10/24/2019. (mme) (Entered: 10/24/2019)	
	Runner	132	11/01/2019	ORDER: On November 1, 2019, pursuant to this Court's prior Order [ECF No. 130], counsel for both parties contacted the Court and provided a status update as to the partial settlement in this matter. After conferring with counsel, the Court ORDERS counsel to jointly contact Judge Major's chambers on or before November 15, 2019 to inform the Court as to whether the parties have finalized a settlement agreement. Signed by Magistrate Judge Barbara Lynn Major on 11/01/2019.(no document attached) (bxr) (Entered: 11/01/2019)	
	Online	133	11/12/2019	NOTICE OF FILING OF OFFICIAL TRANSCRIPT of Proceedings held on 10/23/2019 before Magistrate Judge Barbara Lynn Major. Court Reporter/Transcriber: Ellen L. Simone. Transcript may be viewed at the court public terminal or purchased through the Court Reporter/Transcriber before the deadline for Release of Transcript Restriction. After that date it may be obtained through PACER or the Court Reporter/Transcriber. If redaction is necessary, parties have seven calendar days from the file date of the Transcript to E-File the Notice of Intent to Request Redaction. The following deadlines would also apply if requesting redaction: Redaction Request Statement due to Court Reporter/Transcriber 12/3/2019. Redacted Transcript Deadline set for 12/13/2019. Release of Transcript Restriction set for 2/10/2020. (akr) (Entered: 11/12/2019)	
	Runner	134	11/21/2019	ORDER: On November 15, 2019, pursuant to this Court's prior Order [ECF No. 132], counsel for both parties contacted the Court and provided a status update as to the partial settlement in this matter. After conferring with counsel, the Court ORDERS counsel to jointly contact Judge Major's chambers on or before December 4, 2019 to inform the Court as to whether the parties have finalized a settlement agreement. Signed by Magistrate Judge Barbara Lynn Major on 11/21/19.(no document attached) (bxr) (Entered: 11/21/2019)	

	Availability	#	Date	Proceeding Text	Source
	Online	135	11/27/2019	MOTION to Strike Portions of the Opening Expert Report of Jonathan Wells by Bell Northern Research, LLC. (Attachments: # 1 Memo of Points and Authorities in Support of Motion to Strike Portions of the Opening Expert Report of Jonathan Wells, # 2 Declaration of Sadaf R. Abdullah in Support of Motion to Strike Portions of the Opening Expert Report of Jonathan Wells, # 3 Exhibit A, # 4 Exhibit B, # 5 Exhibit C, # 6 Exhibit D, # 7 Exhibit E, # 8 Exhibit F, # 9 Exhibit G, # 10 Exhibit H, # 11 Exhibit I, # 12 Exhibit J, # 13 Exhibit K, # 14 Exhibit L, # 15 Exhibit M) (Abdullah, Sadaf) (dlg). (Entered: 11/27/2019)	
	Runner	136	12/04/2019	ORDER: On December 4, 2019, pursuant to this Court's prior Order [ECF No. 134], counsel for both parties contacted the Court and provided a status update as to the partial settlement in this matter. After conferring with counsel, the Court ORDERS counsel to jointly contact Judge Major's chambers on or before December 12, 2019 to inform the Court as to whether the parties have finalized a settlement agreement. Signed by Magistrate Judge Barbara Lynn Major on December 4, 2019. (no document attached) (err) (Entered: 12/04/2019)	
	Online	137	12/09/2019	Joint MOTION to Dismiss as to Counts 4, 5, and 7 of BNR's Amended Complaint and Counts VIII, IX, XII, XIII, XIV, and XV of ZTE's Counterclaims by Bell Northern Research, LLC. (Hartsell, Steven) (anh) (Entered: 12/09/2019)	
	Online	138	12/09/2019	ORDER Granting Joint Motion for Dismissal as to Counts 4, 5, and 7 of BNR's Amended Complaint and Counts VIII, IX, XII, XIII, XIV, and XV of ZTE Corporation, ZTE (TX), Inc., and ZTE (USA) Inc.'s Counterclaims [Doc. No. 137]. Signed by Judge Cathy Ann Bencivengo on 12/9/2019. (anh) (Entered: 12/09/2019)	
	Online	139	12/19/2019	RESPONSE in Opposition re 135 MOTION to Strike Portions of the Opening Expert Report of Jonathan Wells filed by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Declaration of Amol Parikh, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 2A, # 5 Exhibit 3, # 6 Exhibit 4, # 7 Exhibit 5, # 8 Exhibit 5A, # 9 Exhibit 6, # 10 Exhibit 6A, # 11 Exhibit 7, # 12 Exhibit 8, # 13 Exhibit 8A, # 14 Exhibit 9, # 15 Exhibit 10, # 16 Exhibit 11, # 17 Exhibit 12) (Parikh, Amol) (anh). (Entered: 12/19/2019)	
	Online	140	12/20/2019	MOTION to Amend/Correct 139 Response in Opposition to Motion,, Motion to Accept Amended Exhibits by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of Amol Parikh, # 3 Exhibit Index, # 4 Exhibit 1, # 5 Exhibit 2, # 6 Exhibit 2A, # 7 Exhibit 3, # 8 Exhibit 4, # 9 Exhibit 5, # 10 Exhibit 5A, # 11 Exhibit 6, # 12 Exhibit 6A, # 13 Exhibit 7, # 14 Exhibit 8, # 15 Exhibit 8A, # 16 Exhibit 9, # 17 Exhibit 10, # 18 Exhibit 11, # 19 Exhibit 12) (Parikh, Amol)(anh). (Entered: 12/20/2019)	

	Availability	#	Date	Proceeding Text	Source
	Online	141	12/26/2019	REPLY to Response to Motion re 135 MOTION to Strike Portions of the Opening Expert Report of Jonathan Wells filed by Bell Northern Research, LLC. (Attachments: # 1 Declaration Supplemental Declaration of Sadaf R. Abdullah, # 2 Exhibit N)(Abdullah, Sadaf) (anh). (Entered: 12/26/2019)	
	Online	142	12/27/2019	ORDER Granting ZTE Corp., ZTE (USA), Inc. and ZTE (TX), Inc.'s Motion to Accept Corrected Exhibits. Signed by Judge Cathy Ann Bencivengo on 12/27/2019. (anh) (Entered: 12/27/2019)	
	Online	143	01/02/2020	Joint MOTION to Take Deposition from Michael Lasinski Out of Time by Bell Northern Research, LLC. (Hartsell, Steven) (anh). (Entered: 01/02/2020)	
	Online	144	01/02/2020	ORDER Granting Joint Motion for Leave to Conduct the Deposition of Third-Party Expert Witness Michael Lasinski Out of Time [ECF No. 143]. Signed by Magistrate Judge Barbara Lynn Major on 1/2/2020. (anh) (Entered: 01/02/2020)	
	Online	145	01/06/2020	MINUTE ORDER: It is hereby ORDERED that an on-the-record telephonic conference is set forJanuary 9, 2020 at 10:00 a.m. before Judge Bencivengo to discuss Bell NorthernResearch, LLCs Motion to Strike Portions of the Opening Expert Report ofJonathan Wells. The parties shall arrange their telephonic appearances through CourtCall as explained in the Courts Chambers Rules. It is SO ORDERED.(anh) (Entered: 01/06/2020)	
	Remote	146	01/09/2020	Minute Order for proceedings held before Judge Cathy Ann Bencivengo:Telephonic Status Conference via CourtCall held 1/9/2020. 135 MOTION to Strike Portions of the Opening Expert Report of Jonathan Wells is granted in part/denied in part for reasons stated by the Court on the record. (Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Abdullah).(Defendant Attorney Thomas DaMario). (no document attached) (lmh) (Entered: 01/09/2020)	
	Online	147	01/15/2020	NOTICE of Appearance by Jason Sheffield Angell on behalf of Broadcom Corporation (Angell, Jason)Attorney Jason Sheffield Angell added to party Broadcom Corporation(pty:misc) (anh). (Entered: 01/15/2020)	
	Online	148	01/15/2020	Ex Parte MOTION Order Enlarging Time by Broadcom Corporation. (Attachments: # 1 Declaration)(Angell, Jason) (anh). (Entered: 01/15/2020)	
	Online	149	01/16/2020	ORDER Enlarging Time for Broadcom Corporation to File A Motion to Seal [Doc. No. 148]. Signed by Judge Cathy Ann Bencivengo on 1/16/2020. (anh) (Entered: 01/16/2020)	
	Online	150	01/17/2020	NOTICE of Appearance of Counsel for Third Party by Mark Andrew Woodmansee on behalf of Kyocera International Inc. (Woodmansee, Mark Andrew)Attorney Mark Andrew Woodmansee added to party Kyocera International Inc.(pty:misc) (anh). (Entered: 01/17/2020)	
	Online	151	01/17/2020	MOTION to File Documents Under Seal (Woodmansee, Mark Andrew) (Entered: 01/17/2020)	
	Online	152	01/17/2020	MOTION to File Documents Under Seal (With attachments)(Hartsell, Steven) (Entered: 01/17/2020)	

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	Availability	#	Date	Proceeding Text	Source
	Online	153	01/17/2020	MOTION to File Documents Under Seal (With attachments)(Parikh, Amol) (Entered: 01/17/2020)	
	Online	154	01/21/2020	ORDER on Motions to File Under Seal (151 , 152 , 153). Signed by Judge Cathy Ann Bencivengo on 1/21/20. (dlg) (Entered: 01/21/2020)	
	Online	155	01/22/2020	MOTION to File Documents Under Seal (With attachments)(Angeli, Jason) (Entered: 01/22/2020)	
	Online	156	01/22/2020	NOTICE of Appearance by Rachael Hiatt on behalf of Broadcom Corporation (Hiatt, Rachael)Attorney Rachael Hiatt added to party Broadcom Corporation(pty:misc) (anh). (Entered: 01/22/2020)	
	Online	157	01/23/2020	ORDER on Broadcom's Motions to File Under Seal. (ECF 155) Signed by Judge Cathy Ann Bencivengo on 1/23/2020. (aef) (Entered: 01/23/2020)	
	Free	158	01/24/2020	MOTION to Strike Portions of the Rebuttal Expert Reports of Dr. Matthew B. Shoemake and Michael J. Lasinski by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Sadaf R. Abdullah, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4)(Abdullah, Sadaf) (sjm). (Entered: 01/24/2020)	
	Free	159	01/24/2020	MOTION to Exclude [Motion to Disqualify Ken I. Hattori as Expert Witness and Exclude His Report] by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Joseph M. Ramirez, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3) (Ramirez, Joseph) (sjm). (Entered: 01/24/2020)	
	Free	160	01/24/2020	MOTION for Partial Summary Judgment that Defendants Failed to Meet Their Burden of Production to Limit Damages Pursuant to 35 U.S.C. 287 by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Steven W. Hartsell, # 2 Exhibit 1)(Skiermont, Paul) (sjm). (Entered: 01/24/2020)	
	Free	161	01/24/2020	MOTION to Strike Portions of the Opening Expert Report of Dr. Anne Layne-Farrar by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Declaration of Amol Parikh, # 2 Exhibit Index, # 3 Exhibit A, # 4 Exhibit B, # 5 Exhibit C)(Parikh, Amol) (sjm). (Entered. 01/24/2020)	
	Free	162	01/24/2020	MOTION for Partial Summary Judgment by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of Amol Parikh, # 3 Exhibit Index, # 4 Exhibit 1, # 5 Exhibit 2, # 6 Exhibit 3, # 7 Exhibit 4, # 8 Exhibit 5, # 9 Exhibit 6, # 10 Exhibit 7, # 11 Exhibit 8, # 12 Exhibit 9, # 13 Exhibit 10, # 14 Exhibit 11, # 15 Exhibit 12, # 16 Exhibit 13, # 17 Exhibit 14, # 18 Exhibit 15, # 19 Exhibit 16, # 20 Exhibit 17)(Parikh, Amol) (sjm). (Entered. 01/24/2020)	
	Online	163	01/24/2020	SEALED Document - Exhibit 1 to Defendant ZTE's Motion for Partial Summary Judgment re. 155 MOTION to File Documents Under Seal. Document to be filed by Clerk if Motion to Seal is granted. (With attachments)(Parikh, Amol) Modified on 1/28/2020 (dlg). (Entered: 01/24/2020)	
	Online	164	01/30/2020	NOTICE (Notice of Institution of Petitions for Inter Partes Review) by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation (Parikh, Amol) (anh). (Entered: 01/30/2020)	

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	Availability	#	Date	Proceeding Text	Source
	Online	165	01/31/2020	Briefing Schedule. Signed by Judge Cathy Ann Bencivengo on 1/31/2020.(anh) (Entered: 01/31/2020)	
	Free	166	02/05/2020	Joint MOTION to Clarify the Court's Order regarding the Briefing Schedule, Doc. No. 165 by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation. (Parikh, Amol) (anh). (Entered: 02/05/2020)	
	Online	167	02/05/2020	MINUTE ORDER: In light of the motion for clarification filed in Case Number 18cv1786 [Doc. No. 166], the Court clarifies that item 3 of the briefing schedule issued on January 31,2020 [Doc. No. 165 in Case No. 18cv1786], applies to all motions filed on January 24, 2020, including Doc. No. 158 in Case No. 18cv1786. It is SO ORDERED. (anh) (Entered: 02/05/2020)	
	Free	168	02/11/2020	NOTICE re Institution of Petition for Inter Partes Review by ZTE (TX), Inc., ZTE (USA) Inc., ZTE Corporation (Parikh, Amol) (anh). (Entered: 02/11/2020)	

Retrieve Document(s)

Patents

Number	Title	Issued	Class	Subclass
7,319,889	System and method for conserving battery power in a mobile station	01/15/2008	455	574
8,204,554	System and method for conserving battery power in a mobile station	06/19/2012	455	574
7,990,842	Backward-compatible long training sequences for wireless communication networks	08/02/2011	370	208
8,416,862	Efficient feedback of channel information in a closed loop beamforming wireless communication system	04/09/2013	375	260
6,941,156	Automatic handoff for wireless piconet multimode cell phone	09/06/2005	455	553.1
8,792,432	Prioritizing RACH message contents	07/29/2014	370	329

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US District Court Docket

US District Court for the Southern District of California

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Header

Case Number: 3:18cv2864
Date Filed: 12/20/2018
Assigned To: Judge Cathy Ann Bencivengo
Referred To: Magistrate Judge Barbara Lynn Major
Nature of Suit: Patent (830)
Cause: Patent Infringement
Lead Docket: None
Other Docket: 3:18cv01783
Jurisdiction: Federal Question

Class Code: Open
Statute: 35:0271
Jury Demand: Plaintiff
Demand Amount: $0
NOS Description: Patent

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Proceedings

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	Availability	#	Date	Proceeding Text	Source
	Free	1	12/20/2018	COMPLAINT with Jury Demand against LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc. (Filing fee $ 400 receipt number 0974-12023438.), filed by Bell Northern Research, LLC. (Attachments: # 1 Civil Cover Sheet, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E, # 7 Exhibit F, # 8 Exhibit G, # 9 Exhibit H, # 10 Exhibit I, # 11 Exhibit J)The new case number is 3:18-cv-2864-LAB-LL. Judge Larry Alan Burns and Magistrate Judge Linda Lopez are assigned to the case. (Malmberg, Mieke)(tcf) (sjt). (Entered: 12/21/2018)	
	Free	2	12/21/2018	Summons issued. Counsel receiving this notice electronically should print this summons and serve it in accordance with Rule 4, Fed.R.Civ.P and LR 4.1. (tcf) (Entered: 12/21/2018)	
	Free	3	12/21/2018	REPORT on the filing or determination of an action regarding **patent** and/or trademark number(s) *7,999,842*, *8,416,862*, *7,957,450*, *6,941,156*, *8,792,432*, *7,039,435*, *6,549,792*, *7,945,285* cc:USPTO (tcf) (Entered: 12/21/2018)	
	Runner	4	12/21/2018	MINUTE ORDER. Judge Larry Alan Burns has declined assignment pursuant to General Order 598. Case reassigned to Judge Marilyn L. Huff for all further proceedings. The new case number is 18cv2864 H (LL). (no document attached) (jcj) (Entered: 12/21/2018)	
	Free	5	01/02/2019	NOTICE OF RELATED CASE(S) by Bell Northern Research, LLC of case(s) 3:18-cv-1783, 3:18-cv-1784, 3:18-cv-1785, 3:18-cv-1786 . (Malmberg, Mieke) (sjm). (Entered: 01/02/2019)	
	Free	6	01/02/2019	SUMMONS Returned Executed by Bell Northern Research, LLC. LG Electronics, Inc. served. (Malmberg, Mieke) (sjm). (Entered: 01/02/2019)	
	Free	7	01/02/2019	SUMMONS Returned Executed by Bell Northern Research, LLC. LG Electronics U.S.A. Inc. served. (Malmberg, Mieke) (sjm). (Entered: 01/02/2019)	
	Free	8	01/02/2019	SUMMONS Returned Executed by Bell Northern Research, LLC. LG Electronics Mobile Research U.S.A., LLC served. (Malmberg, Mieke) (sjm). (Entered: 01/02/2019)	

	Availability	#	Date	Proceeding Text	Source
	Free	9	01/09/2019	ORDER OF TRANSFER PURSUANT TO LOW NUMBER RULE. Case reassigned to Judge Cathy Ann Bencivengo and Magistrate Judge Barbara Lynn Major for all further proceedings. Judge Marilyn L. Huff, Magistrate Judge Linda Lopez no longer assigned to case. Create association to 3:18cv1783-CAB(BLM). The new case number is 18cv2864-CAB(BLM). Signed by Judge Marilyn L. Huff on 1/9/2019. Signed by Judge Cathy Ann Bencivengo on 1/4/2019.(rmc) (Entered: 01/09/2019)	
	Free	10	01/15/2019	NOTICE of Appearance by Mieke Katherine Malmberg on behalf of Bell Northern Research, LLC (Malmberg, Mieke) (jpp). (Entered: 01/15/2019)	
	Free	11	01/15/2019	NOTICE of Party With Financial Interest by Bell Northern Research, LLC . Identifying Corporate Parent Hilco **Patent** Acquisition 56, LLC, Corporate Parent Hilco IP Merchant Capital, LLC, Corporate Parent Hilco, Inc. for Bell Northern Research, LLC. (Malmberg, Mieke) (jpp). (jao). (Entered: 01/15/2019)	
	Free	12	01/15/2019	WAIVER OF SERVICE Returned Executed by Bell Northern Research, LLC. as to LG Electronics, Inc.. (Malmberg, Mieke) (jpp). (Entered: 01/15/2019)	
	Free	13	01/15/2019	MOTION for Extension of Time to File Answer re 1 Complaint,, by Bell Northern Research, LLC. (Malmberg, Mieke) (jpp). (Entered: 01/15/2019)	
	Free	14	01/16/2019	ORDER granting 13 Motion for Extension of Time to respond to complaint. Defendant's response due 4/17/2019. Signed by Judge Cathy Ann Bencivengo on 1/16/2019. (jpp) (Entered: 01/17/2019)	
	Free	15	04/17/2019	ANSWER to 1 Complaint,, with Jury Demand , COUNTERCLAIM against Bell Northern Research, LLC by LG Electronics U.S.A. Inc., LG Electronics, Inc., LG Electronics Mobile Research U.S.A., LLC.(Fuller, Joanna)Attorney Joanna M. Fuller added to party LG Electronics Mobile Research U.S.A., LLC(pty:dft), Attorney Joanna M. Fuller added to party LG Electronics U.S.A. Inc.(pty:dft), Attorney Joanna M. Fuller added to party LG Electronics, Inc.(pty:dft) (anh). (Entered: 04/17/2019)	
	Online	16	04/17/2019	NOTICE of Appearance by Christian A. Chu on behalf of LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc. (Chu, Christian)Attorney Christian A. Chu added to party LG Electronics Mobile Research U.S.A., LLC(pty:dft), Attorney Christian A. Chu added to party LG Electronics U.S.A. Inc.(pty:dft), Attorney Christian A. Chu added to party LG Electronics, Inc.(pty:dft) (anh). (Entered: 04/17/2019)	
	Online	17	04/17/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12419388.) (Application to be reviewed by Clerk.) (Schwentker, Robert) (dsn) (Entered: 04/17/2019)	
	Online	18	04/17/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12419415.) (Application to be reviewed by Clerk.) (Marshall, Stephen) (dsn) (Entered: 04/17/2019)	

	Availability	#	Date	Proceeding Text	Source
	Online	19	04/17/2019	NOTICE of Party With Financial Interest by LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc. . Identifying Other Affiliate LG Electronics Mobile Research U.S.A., LLC for LG Electronics U.S.A. Inc.; Corporate Parent LG Corporation, Other Affiliate LG Electronics U.S.A., Inc. for LG Electronics, Inc. (Fuller, Joanna) (anh). (jao). (Entered: 04/17/2019)	
	Runner	20	04/17/2019	PRO HAC APPROVED: Stephen Andrew Marshall appearing for Defendant LG Electronics Mobile Research U.S.A., LLC (no document attached) (dsn) (Entered: 04/18/2019)	
	Runner	21	04/17/2019	PRO HAC APPROVED: Robert Andrew Schwentker appearing for Defendant LG Electronics Mobile Research U.S.A., LLC (no document attached) (dsn) (Entered: 04/18/2019)	
	Free	22	04/19/2019	Minute Order: It is hereby ORDERED that the claim construction status conference set for April 26, 2019 at 2:00 p.m. in Courtroom 4C in the four cases related to this one (Case Nos. 18cv1783, 18cv1784, 18cv1785, 18cv1786), applies to this case as well. Thus, defense counsel is required to appear at the conference. Due to the short notice, counsel may appear telephonically if needed. It is SO ORDERED.(anh) (Entered: 04/19/2019)	
	Online	23	04/22/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12428993.) (Application to be reviewed by Clerk.) (McKeon, Michael) (mdc) (Entered: 04/22/2019)	
	Runner	24	04/22/2019	PRO HAC APPROVED re 23 : Michael J. McKeon appearing for Counter Claimants LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc., Defendants LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc. (no document attached) (mdc) (Entered: 04/22/2019)	
	Online	25	04/24/2019	NOTICE AND ORDER for Early Neutral Evaluation and Case Management Conference. Signed by Magistrate Judge Barbara Lynn Major on 4/24/2019.(anh) (Entered: 04/24/2019)	
	Online	26	04/25/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12445428) (Application to be reviewed by Clerk.) (Abdullah, Sadaf) (mdc) (Entered: 04/25/2019)	
	Online	27	04/25/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12445449.) (Application to be reviewed by Clerk.) (Hartsell, Steven) (mdc) (Entered: 04/25/2019)	
	Online	28	04/25/2019	NOTICE Regarding Telephonic Appearance at Claim Construction Status Conference by LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc. re 22 Order,, Set Deadlines/Hearings, (Fuller, Joanna) (anh). (Entered: 04/25/2019)	

	Availability	#	Date	Proceeding Text	Source
	Runner	29	04/26/2019	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Status Hearing re Claim Construction held on 4/26/2019. This matter is confirmed for the Early Neutral Evaluation 5/28/2019 before Magistrate Judge Major and shall trail the related actions.(Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Abdullah and Steven Hartsell). (Defendant Attorney Stephen Marshall, Michael McKeon (telephonic) and Joanna Fuller). (no document attached) (lmh) (Entered: 04/29/2019)	
	Online	30	04/29/2019	ORDER Approving the Pro Hac Vice Application of Sadaf R. Abdullah, re 26 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 4/25/2019. (mdc) (Entered: 04/29/2019)	
	Online	31	04/29/2019	ORDER Approving the Pro Hac Vice Application of Steven W. Hartsell, re 27 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 4/25/2019. (mdc) (Entered: 04/29/2019)	
	Free	32	05/06/2019	NOTICE OF FILING OF OFFICIAL TRANSCRIPT of Proceedings held on 4/26/2019 before Judge Cathy Ann Bencivengo. Court Reporter/Transcriber: Mauralee Ramirez. Transcript may be viewed at the court public terminal or purchased through the Court Reporter/Transcriber before the deadline for Release of Transcript Restriction. After that date it may be obtained through PACER or the Court Reporter/Transcriber. If redaction is necessary, parties have seven calendar days from the file date of the Transcript to E-File the Notice of Intent to Request Redaction. The following deadlines would also apply if requesting redaction: Redaction Request Statement due to Court Reporter/Transcriber 5/28/2019. Redacted Transcript Deadline set for 6/6/2019. Release of Transcript Restriction set for 8/5/2019. (Transcript filed in case numbers 3:18-cv-01783-CAB-BLM, 3:18-cv-01784-CAB-BLM, 3:18-cv-01785-CAB-BLM,3:18-cv-01786-CAB-BLM, and 3:18-cv-02864-CAB-BLM.) (akr) (Entered: 05/06/2019)	
	Online	33	05/08/2019	REPLY - Other re 15 Answer to Complaint,, Counterclaim, filed by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered: 05/08/2019)	
	Online	34	05/15/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12514481.)(Application to be reviewed by Clerk.)(Skiermont, Paul)(jrd) (Entered: 05/15/2019)	
	Online	35	05/17/2019	ORDER Approving the Pro Hac Vice Application of Paul J. Skiermont, re 34 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 5/16/2019. (mdc) (Entered: 05/17/2019)	
	Free	36	05/21/2019	REPORT of Rule 26(f) Planning Meeting. (Hartsell, Steven) (anh). (Entered: 05/21/2019)	

	Availability	#	Date	Proceeding Text	Source
	Runner	37	05/28/2019	Minute Entry for proceedings held before Magistrate Judge Barbara Lynn Major: Early Neutral Evaluation Conference held on 5/28/2019. Case did not settle. Case Management Conference held on 5/28/2019. Order to follow. (Plaintiff Attorney Sadaf Abdullah; Paul Skiermont). (Defendant Attorney Stephen Marshall; Joanna Fuller). (no document attached) (bxr) (Entered: 05/28/2019)	
	Free	38	05/29/2019	Case Management Order Regulating Discovery and Other Pretrial Proceedings. Signed by Magistrate Judge Barbara Lynn Major on 5/29/2019.(anh) (Entered: 05/29/2019)	
	Free	39	06/14/2019	Joint MOTION for Protective Order , Joint MOTION for Production of Electronically Stored Information (ESI) by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A - Proposed Protective Order, # 2 Exhibit B - Proposed ESI Order)(Hartsell, Steven) (anh). (Entered: 06/14/2019)	
	Free	40	06/18/2019	ORDER Granting Joint Motion for Entry of Protective Order and ESI Order with Modifications [ECF No. 39]. Signed by Magistrate Judge Barbara Lynn Major on 6/18/2019. (anh) (Entered: 06/18/2019)	
	Online	41	08/01/2019	Request to Appear Pro Hac Vice (Filing fee received. $ 206 receipt number 0974-12783534.) (Application to be reviewed by Clerk.) (Tishman, Daniel) (mdc) (Entered: 08/01/2019)	
	Runner	42	08/01/2019	PRO HAC APPROVED re 41 : Daniel Tishman appearing for Counter Claimants LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc., Defendants LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc. (no document attached) (mdc) (Entered: 08/01/2019)	
	Online	43	08/02/2019	MOTION to Amend/Correct 15 Answer to Complaint,, Counterclaim, Motion to File First Amended Answer by LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc.. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration, # 3 Exhibit 1, # 4 Exhibit 2, # 5 Exhibit 3) (Tishman, Daniel) (anh). Modified on 8/29/2019 to note that 43-1 and 43-3 ordered sealed on 8/29/2019 per 58 Order (rmc). Modified on 9/3/2019 to seal previously filed document 43-4 per 63 Order (rmc). (Entered: 08/02/2019)	
	Free	44	08/08/2019	Ex Parte MOTION to Amend/Correct 38 Scheduling Order, Set Deadlines/Hearings [LGs Notice of Motion and Unopposed Ex Parte Motion to Amend the Schedule in the Case Management Order] by LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc.. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration)(Tishman, Daniel) (anh). (Entered: 08/08/2019)	
	Free	45	08/12/2019	ORDER Granting Defendants' Unopposed Ex Parte Motion to Amend the Court's Case Management Order [ECF. No. 44]. Signed by Magistrate Judge Barbara Lynn Major on 8/12/2019. (anh) (Entered: 08/12/2019)	
	Online	46	08/16/2019	MOTION to File Documents Under Seal (Abdullah, Sadaf) (rmc). (Entered: 08/16/2019)	

	Availability	#	Date	Proceeding Text	Source
	Online	47	08/20/2019	ORDER Granting 46 Unopposed Motion to File Documents Under Seal. Signed by Judge Cathy Ann Bencivengo on 8/20/2019. (aef) (Entered: 08/20/2019)	
	Online	48	08/20/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12850973.) (Application to be reviewed by Clerk) (Gasser, Alexander) (mdc) (Entered: 08/20/2019)	
	Online	49	08/20/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12851014.) (Application to be reviewed by Clerk.) (Udick, Steven) (mdc) (Entered: 08/20/2019)	
	Online	50	08/20/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12851036) (Application to be reviewed by Clerk.) (Hodge, Christopher) (mdc) (Entered: 08/20/2019)	
	Online	51	08/23/2019	RESPONSE in Opposition re 43 MOTION to Amend/Correct 15 Answer to Complaint,, Counterclaim, Motion to File First Amended Answer filed by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Sadaf R. Abdullah, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C)(Abdullah, Sadaf) (anh). (Entered: 08/23/2019)	
	Online	52	08/23/2019	(** Filed as Sealed Document 53 on 8/23/2019** SEALED LODGED Proposed Document re: 46 MOTION to File Documents Under Seal. Document to be filed by Clerk if Motion to Seal is granted. (With attachments)(Abdullah, Sadaf) (Main Document 52 replaced on 8/23/2019) (rmc). Modified on 8/23/2019 to add file date of lodgment (rmc). (Entered: 08/23/2019)	
	Online	54	08/27/2019	ORDER Approving the Pro Hac Vice Application of Christopher M. Hodge (Re: ECF No. 50 Request to Appear Pro Hac Vice). Signed by Judge Cathy Ann Bencivengo on 8/26/2019.(jrd) (Entered: 08/27/2019)	
	Online	55	08/27/2019	ORDER Approving the Pro Hac Vice Application of Steven J. Udick (Re: ECF No. 49 Request to Appear Pro Hac Vice). Signed by Judge Cathy Ann Bencivengo on 8/26/2019.(jrd) (Entered: 08/27/2019)	
	Online	56	08/27/2019	ORDER Approving the Pro Hac Vice Application of Alexander E. Gasser (Re: ECF No. 48 Request to Appear Pro Hac Vice). Signed by Judge Cathy Ann Bencivengo on 8/26/2019.(jrd) (Entered: 08/27/2019)	
	Online	57	08/28/2019	MOTION to File Documents Under Seal (Hodge, Christopher) (rmc). (Entered: 08/28/2019)	
	Online	58	08/29/2019	ORDER Granting 57 Unopposed Motion to File Documents Under Seal. Signed by Judge Cathy Ann Bencivengo on 8/29/2019. (rmc) (Entered: 08/29/2019)	
	Online	59	08/30/2019	REDACTION to 58 Order on Motion to File Documents Under Seal Redaction to Docket Entries [43-1], [43-3], [43-4] Pursuant to 58 Order on Motion to File Documents Under Seal by LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc.. (Attachments: # 1 Exhibit 1, # 2 Exhibit 2, # 3 Proof of Service)(Tishman, Daniel) (anh). (Entered: 08/30/2019)	

	Availability	#	Date	Proceeding Text	Source
	Online	60	08/30/2019	REPLY to Response to Motion re 43 MOTION to Amend/Correct 15 Answer to Complaint,, Counterclaim, Motion to File First Amended Answer [LGs Reply Memorandum of Points and Authorities in Support of its Motion to File its First Amended Answer] filed by LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc.. (Tishman, Daniel) (anh). (Entered: 08/30/2019)	
	Online	61	09/03/2019	MOTION to File Documents Under Seal (Hodge, Christopher) (rmc). (Entered: 09/03/2019)	
	Online	62	09/03/2019	ORDER Granting Motion to Amend Answer to Complaint [Doc. No. 43]. Signed by Judge Cathy Ann Bencivengo on 9/3/2019. (anh) (Entered: 09/03/2019)	
	Online	63	09/03/2019	ORDER Granting 61 Unopposed Motion to File Documents Under Seal. Signed by Judge Cathy Ann Bencivengo on 9/3/2019. (rmc) (Entered: 09/03/2019)	
	Online	64	09/04/2019	Amended ANSWER to 1 Complaint,, with Jury Demand [First Amended Answer to Complaint for **Patent** Infringement and Counterclaims], COUNTERCLAIM against Bell Northern Research, LLC by LG Electronics, Inc., LG Electronics U.S.A. Inc., LG Electronics Mobile Research U.S.A., LLC.(Fuller, Joanna) (anh). (Entered: 09/04/2019)	
	Online	65	09/06/2019	NOTICE of Appearance by Jaime Olin on behalf of Bell Northern Research, LLC (Olin, Jaime)Attorney Jaime Olin added to party Bell Northern Research, LLC(pty:pla) (anh). (Entered: 09/06/2019)	
	Online	66	09/12/2019	NOTICE of Appearance by Min Suk Huh on behalf of LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc. (Huh, Min Suk)Attorney Min Suk Huh added to party LG Electronics Mobile Research U.S.A., LLC(pty:dft), Attorney Min Suk Huh added to party LG Electronics U.S.A. Inc.(pty:dft), Attorney Min Suk Huh added to party LG Electronics, Inc.(pty:dft) (anh). (Entered: 09/12/2019)	
	Error	67	09/13/2019	*** REFILED AS 68 *** - Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12937058.) (Application to be reviewed by Clerk.) (Bright, Jonathan) Modified text on 9/13/2019 to indicate refiled status. (mdc) (Entered: 09/13/2019)	
	Online	68	09/13/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12937058 - See 67 .) (Application to be reviewed by Clerk.) (Bright, Jonathan) Modified text on 9/13/2019 to add filing fee info. (mdc) (Entered: 09/13/2019)	
	Runner	69	09/13/2019	PRO HAC APPROVED re 68 : Jonathan Benjamin Bright appearing for LG parties. (no document attached) (mdc) (Entered: 09/13/2019)	
	Online	70	09/20/2019	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-12966737.)(Application to be reviewed by Clerk.)(Ramirez, Joseph)(jrd) (Entered: 09/20/2019)	

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	Availability	#	Date	Proceeding Text	Source
	Online	71	09/23/2019	ORDER Approving the Pro Hac Vice Application of Joseph M. Ramirez, re 70 Request to Appear Pro Hac Vice. Signed by Judge Cathy Ann Bencivengo on 9/20/2019. (mdc) (Entered: 09/24/2019)	
	Online	72	10/07/2019	Joint MOTION to Dismiss Counts 1 and 4 of the Complaint and Defendants' Counterclaims 1, 4, 9, and 12 by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered: 10/07/2019)	
	Online	73	10/09/2019	ORDER Granting Joint 72 Motion to Dismiss Counts 1 to 4 of Plaintiff's Complaint and Defendants Counterclaims 1,4,9 and 12. Signed by Judge Cathy Ann Bencivengo on 10/9/19. (dlg) (Entered: 10/09/2019)	
	Free	74	10/11/2019	JOINT HEARING STATEMENT by Bell Northern Research, LLC. (Attachments: # 1 Appendix A - Joint Claim Construction Worksheet, # 2 Appendix B - Joint Claim Construction Chart)(Abdullah, Sadaf) (anh). (Entered: 10/11/2019)	
	Online	75	10/11/2019	MOTION to Withdraw as Attorney Christopher M. Hodge by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Steven W. Hartsell in Support)(Hartsell, Steven) (anh). (Entered: 10/11/2019)	
	Online	76	10/11/2019	ORDER Granting Plaintiff's Notice of Motion and Motion to Withdraw Christopher Hodge as Counsel of Record. Signed by Judge Cathy Ann Bencivengo on 10/11/2019. (anh) (Entered: 10/11/2019)	
	Free	77	10/30/2019	Joint MOTION for Order Parties' Joint Motion for Entry of Prior Claim Construction Order as to Certain Specified **Patents** by LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc.. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C) (Marshall, Stephen) (anh). (Entered: 10/30/2019)	
	Free	78	11/01/2019	ORDER Granting the Parties' Joint Motion for Entry of Prior Claim Construction Order as to Certain Specified **Patents** [Doc. No. 77]. Signed by Judge Cathy Ann Bencivengo on 11/1/2019. (anh) (Entered: 11/01/2019)	
	Online	79	11/07/2019	MINUTE ORDER: It is hereby ORDERED that the status conference set for November 12, 2019 at 2:00 p.m. is converted to a telephonic off-the-record conference. Plaintiffs counsel shall initiate the conference by calling Judge Bencivengos chambers with defense counsel on the line. It is SO ORDERED. (anh) (anh) (Entered: 11/07/2019)	
	Free	80	11/12/2019	ORDER Re: Claim Construction Hearing. Signed by Judge Cathy Ann Bencivengo on 11/12/2019.(anh) (Entered: 11/12/2019)	
	Runner	81	11/12/2019	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Telephonic (In Chambers) Claims Construction Status Conference was held on 11/12/2019. Order has been issued.(Plaintiff Attorney Steven Hartsell and Mieke Malmberg). (Defendant Attorney Joanna Fuller, Stephen Marshall and Michael McKeon). (no document attached) (lmh) (Entered: 11/13/2019)	

	Availability	#	Date	Proceeding Text	Source
	Free	82	11/22/2019	MOTION for Summary Judgment on Indefiniteness by LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc.. (Attachments: # 1 Memo of Points and Authorities, # 2 Declaration of Joanna M. Fuller, # 3 Exhibit 1, # 4 Exhibit 2, # 5 Exhibit 3, # 6 Exhibit 4, # 7 Exhibit 5, # 8 Exhibit 6, # 9 Exhibit 7, # 10 Exhibit 8, # 11 Exhibit 9, # 12 Exhibit 10, # 13 Exhibit 11, # 14 Exhibit 12, # 15 Exhibit 13, # 16 Exhibit 14, # 17 Exhibit 15, # 18 Exhibit 16, # 19 Exhibit 17)(Fuller, Joanna) (anh). (Entered: 11/22/2019)	
	Free	83	11/22/2019	CLAIM CONSTRUCTION BRIEF by LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc.. (Attachments: # 1 Declaration of Joanna M. Fuller, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4, # 6 Exhibit 5, # 7 Exhibit 6, # 8 Exhibit 7, # 9 Exhibit 8, # 10 Exhibit 9, # 11 Exhibit 10, # 12 Exhibit 11, # 13 Exhibit 12, # 14 Exhibit 13, # 15 Exhibit 14, # 16 Exhibit 15, # 17 Exhibit 16, # 18 Exhibit 17, # 19 Exhibit 18, # 20 Exhibit 19, # 21 Exhibit 20, # 22 Exhibit 21, # 23 Exhibit 22, # 24 Exhibit 23, # 25 Exhibit 24, # 26 Exhibit 25, # 27 Exhibit 26, # 28 Exhibit 27, # 29 Exhibit 28, # 30 Exhibit 29, # 31 Exhibit 30, # 32 Exhibit 31)(Fuller, Joanna) (anh). (Entered: 11/22/2019)	
	Free	84	11/22/2019	CLAIM CONSTRUCTION BRIEF by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Sadaf R. Abdullah, # 2 Exhibit A, # 3 Exhibit B (part 1), # 4 Exhibit B (part 2), # 5 Exhibit C, # 6 Exhibit D, # 7 Exhibit E, # 8 Exhibit F, # 9 Exhibit G, # 10 Exhibit H (part 1), # 11 Exhibit H (part 2), # 12 Exhibit H (part 3), # 13 Exhibit H (part 4), # 14 Exhibit I (part 1), # 15 Exhibit I (part 2), # 16 Exhibit I (part 3), # 17 Exhibit J, # 18 Exhibit K, # 19 Exhibit L, # 20 Exhibit M, # 21 Exhibit N, # 22 Exhibit O) (Abdullah, Sadaf) (anh). (Entered: 11/22/2019)	
	Online	85	11/25/2019	MOTION for Leave to File Excess Pages For Its Opposition Brief on Indefiniteness by Bell Northern Research, LLC. (Abdullah, Sadaf) (anh). (Entered: 11/25/2019)	
	Online	86	11/26/2019	ORDER Granting Plaintiff's Unopposed Motion for Five Additional Pages for It's Opposition Brief on Indefiniteness [Doc. No. 85]. Signed by Judge Cathy Ann Bencivengo on 11/26/2019. (anh) (Entered: 11/26/2019)	
	Online	87	12/20/2019	RESPONSE TO CLAIM CONSTRUCTION BRIEF by LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc.. (Attachments: # 1 Declaration of Joanna M. Fuller, # 2 Exhibit 32, # 3 Exhibit 33, # 4 Exhibit 34, # 5 Exhibit 35)(Fuller, Joanna) (anh). (Entered: 12/20/2019)	
	Online	88	12/20/2019	RESPONSE in Opposition re 82 MOTION for Summary Judgment on Indefiniteness filed by Bell Northern Research, LLC. (Attachments: # 1 Declaration of Mieke Malmberg, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E, # 7 Exhibit F, # 8 Exhibit G) (Malmberg, Mieke) (anh). (Entered: 12/20/2019)	

	Availability	#	Date	Proceeding Text	Source
	Online	89	12/20/2019	RESPONSE TO CLAIM CONSTRUCTION BRIEF by Bell Northern Research, LLC. (Attachments: # 1 Declaration Supplemental Declaration of Sadaf Abdullah, # 2 Exhibit E, # 3 Exhibit Cv(Abdullah, Sadaf) (anh). (Entered: 12/20/2019)	
	Online	90	01/06/2020	REPLY to Response to Motion re 82 MOTION for Summary Judgment on Indefiniteness - LG Defendants' Reply in Support of Their Motion for Summary Judgment on Indefiniteness filed by LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc.. (Attachments: # 1 Declaration of Joanna M. Fuller, # 2 Exhibit 18, # 3 Exhibit 19, # 4 Exhibit 20, # 5 Exhibit 21) (Fuller, Joanna) (anh). (Entered: 01/06/2020)	
	Online	91	01/08/2020	MOTION to Allow the Use of Electrical Equipment in the Courtroom -Defendants Motion for Order Authorizing Use of Electronic Equipment in Courtroom for Claim Construction Hearing January 16, 2020 by LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc.. (Fuller, Joanna) (anh). (Entered: 01/08/2020)	
	Online	92	01/08/2020	ORDER Granting Defendants' Motion for Order Authorizing Use of Electronic Equipment In Courtroom for Claim Construction Hearing January 16, 2020 [Doc. No. 91]. Signed by Judge Cathy Ann Bencivengo on 1/8/2020. (anh) (Entered: 01/08/2020)	
	Online	93	01/10/2020	MOTION to Allow the Use of Electrical Equipment in the Courtroom by Bell Northern Research, LLC. (Malmberg, Mieke) (anh). (Entered: 01/10/2020)	
	Online	94	01/10/2020	JOINT HEARING STATEMENT by Bell Northern Research, LLC. (Attachments: # 1 Appendix A - Amended Joint Claim Construction Worksheet, # 2 Appendix B - Amended Joint Claim Construction Chart)(Malmberg, Mieke) (anh). (Entered: 01/10/2020)	
	Online	95	01/10/2020	ORDER Granting Plaintiffs Motion for Order Authorizing Use of Electronic Equipment In Courtroom for Claim Construction Hearing January 16, 2020 [Doc. No. 93]. Signed by Judge Cathy Ann Bencivengo on 1/10/2020. (anh) (Entered: 01/10/2020)	
	Free	96	01/15/2020	Request to Appear Pro Hac Vice (Filing fee received: $ 206 receipt number 0974-13370770.) (Application to be reviewed by Clerk) (Whitworth, Laura) (rmc). (Entered: 01/15/2020)	
	Runner	97	01/15/2020	PRO HAC APPROVED: Laura Carnell Whitworth appearing for Defendants LG Electronics Mobile Research U.S.A., LLC, LG Electronics U.S.A. Inc., LG Electronics, Inc. (no document attached) (rmc) (Entered: 01/15/2020)	
	Runner	98	01/16/2020	Minute Entry for proceedings held before Judge Cathy Ann Bencivengo: Claims Construction Hearing held on 1/16/2020.(Court Reporter/ECR Mauralee Ramirez). (Plaintiff Attorney Sadaf Abdullah, Mieke Malmberg and Steven Udick). (Defendant Attorney Michael McKeon, Joanna Fuller and Robert Schwentker). (no document attached) (lmh) (Entered: 01/16/2020)	

NXP - Exhibit 1004 - Page 367

	Availability	#	Date	Proceeding Text	Source
	Online	99	01/21/2020	Claim Construction ORDER and ORDER on Motion for Summary Judgment of Indefiniteness [Doc. No. 82]. Signed by Judge Cathy Ann Bencivengo on 1/21/2020. (anh) (Entered: 01/21/2020)	
	Online	100	01/30/2020	Joint MOTION for Protective Order [Motion for Stipulated Supplemental Protective Order] by Bell Northern Research, LLC. (Attachments: # 1 Exhibit A - Proposed Order)(Udick, Steven) (anh). (Entered: 01/30/2020)	
	Online	101	01/30/2020	NOTICE [Joint Notice of Proposed Scheduling Order and Notice Regarding Inter Partes Reviews] by Bell Northern Research, LLC (Attachments: # 1 Exhibit A - Proposed Order)(Udick, Steven) (anh). (Entered: 01/30/2020)	
	Online	102	02/04/2020	ORDER Granting Joint Motion for Entry of Protective Order Between Plaintiff, Defendants, and Non-Party Qualcomm Incorporated. Signed by Magistrate Judge Barbara Lynn Major on 2/4/2020. (anh) (Entered: 02/05/2020)	
	Online	103	02/05/2020	SCHEDULING ORDER Regulating Discovery and Other Pretrial Proceedings. Signed by Judge Cathy Ann Bencivengo on 2/5/2020.(anh) (Entered: 02/05/2020)	

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Patents

Number	Title	Issued	Class	Subclass
7,990,842	Backward-compatible long training sequences for wireless communication networks	08/02/2011	370	208
8,416,862	Efficient feedback of channel information in a closed loop beamforming wireless communication system	04/09/2013	375	260
7,957,450	Method and system for frame formats for MIMO channel measurement exchange	06/07/2011	375	130
6,941,156	Automatic handoff for wireless piconet multimode cell phone	09/06/2005	455	553.1
8,792,432	Prioritizing RACH message contents	07/29/2014	370	329
7,039,435	Proximity regulation system for use with a portable cell phone and a method of operation thereof	05/02/2006	455	522
6,549,792	Accelerometer influenced communication device	04/15/2003	455	550.1
7,945,285	Integrating a digital encoded-audio bit stream player in a radio-frequency telephone handset	05/17/2011	455	556.1
7,646,703	Backward-compatible long training sequences for wireless communication networks	01/12/2010	370	208
7,738,583	Reduced feedback for beamforming in a wireless communication	06/15/2010	375	267
7,564,914	Method and system for frame formats for MIMO channel measurement exchange	07/21/2009	375	267
6,845,238	Inter-frequency measurement and handover for wireless communications	01/18/2005	455	436
702,363	Cordless telephone with MP3 player capability	04/20/2010	455	556.1

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Intellectual Property (2)

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1. SILVER STATE

UT State Trademarks | UT TM Reg. No. 7990842; ST TM Ser. No. 78912241

... Utah Trademarks UT TM Reg. No. **7990842** ST TM Ser. No. 78912241 active 78912241 2 THE WORDS "SILVER ...
... 4080 GLOBEVILLE ROAD DENVER CO 80216 AS OF May 03, 2011 7990842 COLORADO PETROLEUM PRODUCTS CO (COLORADO CORPORATION) 4080 GLOBEVILLE ROAD DENVER CO ...

2. Tator's Big Race

U.S. Copyrights - Monographs | Oct 16, 2014 | TX0007990842

... United States Copyright Office Reg. No. TX **7990842** Tator's Big Race. Tator's Big Race Tator's Big Race 2010 2010-09-01 ...

1

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Cases (4) Sort by: Relevance

1. Bell N. Research, LLC v. ZTE Corp.

   United States District Court for the Southern District of California | Apr 12, 2019 | 2019 U.S. Dist. LEXIS 63615

2. Bell Northern Research, LLC v. Coolpad Techs., Inc.

   United States District Court for the Southern District of California | Aug 09, 2019 | 2019 U.S. Dist. LEXIS 134702

3. Bell Northern Research, LLC v. Coolpad Techs., Inc.

   United States District Court for the Southern District of California | Aug 12, 2019 | 2019 U.S. Dist. LEXIS 135838

4. Bell Northern Research, LLC v. LG Elecs., Inc.

   United States District Court for the Southern District of California | Oct 09, 2019 | 2019 U.S. Dist. LEXIS 175774

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News (3) Sort by: Relevance

1. US Patent Issued to Broadcom on Aug. 2 for "Backward-Compatible Long Training Sequences for Wireless Communication Networks" (California Inventors)

   US Fed News | Aug 03, 2011 | 231 words
   ... 2010, under Application No. 12/684,650. For further information please visit: http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetahtml%2FPTO%2Fsearch-bool.html&r=1&f=G&l=50&co1=AND&d=PTXT&s1=**7990842**&OS=**7990842**&RS=**7990842** For any query with respect to this article or any other ...
   ... Va. , Aug. 3 -- United States Patent no. **7,990,842** , issued on Aug. 2, was assigned to Broadcom Corp. (Irvine, ...

2. Broadcom Assigned Patent for Backward-compatible Long Training Sequences for Wireless Communication Networks

   Targeted News Service | Aug 05, 2011 | 246 words | Targeted News Service
   ... (12/684,650). The full-text of the patent can be found at http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetahtml%2FPTO%2Fsearch-bool.html&r=1&f=G&l=50&co1=AND&d=PTXT&s1=**7,990,842**&OS=**7,990,842**&RS=**7,990,842** Written by Satyaban Rath; edited by Hemanta Panigrahi. For more information ...
   ... -- Broadcom, Irvine, Calif. , has been assigned a patent (**7,990,842**) developed by Jason Alexander Trachewsky, Menlo Park , Calif. , ...

3. Rural Road of Construction Works

   Tenders Monitor Africa-Asia | Dec 19, 2017 | 216 words
   ... accurate information kindly refer the original document.] Document : http://www.bidsinfo.com /adminexe/documents/-TR1~20171218- **7990842**.html...

Content type: News
Terms: 7990842 or 7,990,842
Search Type: Boolean - Fewer Results
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/686,468	11/18/2019	3992	3960	1382.001RE	25	1

CONFIRMATION NO. 2785

CORRECTED FILING RECEIPT

22186
MENDELSOHN DUNLEAVY, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 312
PHILADELPHIA, PA 19102

OC000000113967697

Date Mailed: 01/15/2020

Receipt is acknowledged of this reissue patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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Inventor(s)

Jason Alexander Trachewsky, Menlo Park, CA;
Rajendra T. Moorti, Mountain View, CA;

Applicant(s)

Bell Northern Research, LLC, Chicago, IL, Assignee (with 37 CFR 1.172 Interest);

Assignment For Published Patent Application

Bell Northern Research, LLC, Chicago, IL

Power of Attorney: The patent practitioners associated with Customer Number 22186

Domestic Priority data as claimed by applicant

This application is a REI of 12/684,650 01/08/2010 PAT 7990842
which is a CON of 11/188,771 07/26/2005 PAT 7646703
which claims benefit of 60/591,104 07/27/2004
and claims benefit of 60/634,102 12/08/2004

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 12/19/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/686,468**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Title

Backward-Compatible Long Training Sequences for Wireless Communication Networks

Preliminary Class

370

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Reference # *(Patent #, Application #, Trademark Serial #, Registration #, etc.)*	**Title of Invention or Mark Information**	
16/686,468	Backward-Compatible Long Training Sequences for Wireless Communication Networks	
Attorney Docket # *(if applicable)*	**Payment Date** *(mm/dd/yyyy)*	**Refund Request Amount**
1382.001RE	12/16/2019	$ 300.00

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Rationale *(Supporting documentation may be submitted with this form)*

A preliminary amendment was filed in the above-referenced application on November 18,2019. As a result, the total number of claims is 25. We have paid for the five extra claims on November 18, 2019 and no additional fee was believed to be due. Please refund $300.00 (fee code 1205) that was charged to our Deposit Account No. 50-0782 on December 16, 2019.

Requester's Information

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1500 John F. Kennedy Blvd.	Philadelphia	PA
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Suite 312	USA	19102
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eri@mendelip.com	215-207-0083	
Requester's Name	**Registration Number** *(if applicable)*	
Steve Mendelsohn	35951	
Signature	**Date** *(mm/dd/yyyy)*	
/Steve Mendelsohn/	01/08/2020	

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EFS ID:	38234853
Application Number:	16686468
International Application Number:	
Confirmation Number:	2785
Title of Invention:	Backward-Compatible Long Training Sequences for Wireless Communication Networks
First Named Inventor/Applicant Name:	Jason Alexander Trachewsky
Customer Number:	22186
Filer:	Steve Mendelsohn/Eri Yoneda
Filer Authorized By:	Steve Mendelsohn
Attorney Docket Number:	1382.001RE
Receipt Date:	08-JAN-2020
Filing Date:	18-NOV-2019
Time Stamp:	11:45:55
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Refund Request	1382_001RE_Fee_Refund_Request_Form_PTO2326.pdf	694780 9ccffd382a930cc98f41c91caf5df5be8be2b80f	no	1

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/686,468

APPLICATION AS FILED - PART I

	(Column 1)	(Column 2)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE($)	FEE($)		RATE($)	FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	2200
TOTAL CLAIMS (37 CFR 1.16(i))	28 minus 20 =	* 8			OR	x 100 =	800
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*				x 460 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	3960

APPLICATION AS AMENDED - PART II

AMENDMENT A

	(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B

	(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/686,468	11/18/2019	2414	3960	1382.001RE	28	1

CONFIRMATION NO. 2785

22186
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1500 JOHN F. KENNEDY BLVD., SUITE 312
PHILADELPHIA, PA 19102

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OC000000113488222

Date Mailed: 12/20/2019

Receipt is acknowledged of this reissue patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Jason Alexander Trachewsky, Menlo Park, CA;
Rajendra T. Moorti, Mountain View, CA;

Applicant(s)

Bell Northern Research, LLC, Chicago, IL, Assignee (with 37 CFR 1.172 Interest);

Assignment For Published Patent Application

Bell Northern Research, LLC, Chicago, IL

Power of Attorney: The patent practitioners associated with Customer Number 22186

Domestic Priority data as claimed by applicant

This application is a REI of 12/684,650 01/08/2010 PAT 7990842
which is a CON of 11/188,771 07/26/2005 PAT 7646703
which claims benefit of 60/591,104 07/27/2004
and claims benefit of 60/634,102 12/08/2004

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 12/19/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/686,468**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Title

Backward-Compatible Long Training Sequences for Wireless Communication Networks

Preliminary Class

370

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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NXP - Exhibit 1004 - Page 385

United States Patent and Trademark Office
Office of the Chief Financial Officer

Document Code:WFEE

User :C46472

Sale Accounting Date:12/16/2019

Sale Item Reference Number	Effective Date
16686468	11/18/2019

Document Number	Fee Code	Fee Code Description	Amount Paid	Payment Method
I2019BF845551833	1205	REISSUE CLAIMS IN EXCESS OF 20	$300.00	Deposit Account

PTO/AIA/80 (07-12)
Approved for use through 11/30/2014. OMB 0651-0035
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

■ Practitioners associated with Customer Number: 22186

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

■ The address associated with Customer Number: 22186

OR

☐

Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address: Bell Northern Research LLC
401 North Michigan Avenue
Chicago Illinois 60611

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be Filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	Afzal Dean	Date	Nov. 14, 2019
Name	Afzal Dean	Telephone	
Title	President		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	Backward-Compatible Long Training Sequences for Wireless Communication Networks
First Named Inventor/Applicant Name:	Jason Alexander Trachewsky
Filer:	Steve Mendelsohn/Eri Yoneda
Attorney Docket Number:	1382.001RE

Filed as Large Entity

Filing Fees for Reissue (Utility)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY REISSUE BASIC	1014	1	300	300
REISSUE OR REISSUE DESIGN CPA SEARCH FEE	1114	1	660	660
REISSUE OR REISSUE DESIGN CPA EXAM. FEE	1314	1	2200	2200
Pages:				
Claims:				
REISSUE CLAIMS IN EXCESS OF 20	1205	5	100	500
Miscellaneous-Filing:				
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**3660**

Electronic Acknowledgement Receipt

EFS ID:	37777320
Application Number:	16686468
International Application Number:	
Confirmation Number:	2785
Title of Invention:	Backward-Compatible Long Training Sequences for Wireless Communication Networks
First Named Inventor/Applicant Name:	Jason Alexander Trachewsky
Customer Number:	22186
Filer:	Steve Mendelsohn/Eri Yoneda
Filer Authorized By:	Steve Mendelsohn
Attorney Docket Number:	1382.001RE
Receipt Date:	18-NOV-2019
Filing Date:	
Time Stamp:	12:36:13
Application Type:	Reissue (Utility)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$3660
RAM confirmation Number	E2019AHC37088409
Deposit Account	500782
Authorized User	Eri Yoneda

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Reissue Application	1382_001RE_Reissue_Application_Transmittal_PTOAIA50.pdf	293637 ce9e933db52f2dd49d7ac5461c3f49419d0a0bb8	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	1382_001RE_Reissue_Application_Fee_Transmittal_PTOSB56.pdf	234783 2f5483415bbc8f6cf99257aa504a7bcecbab611d	no	2
Warnings:					
Information:					
3	Application Data Sheet	1382_001RE_ADS.pdf	1793616 09e5094ac7bb34eb1c9c25b5e180f5c7f6519d76	no	9
Warnings:					
Information:					
4	Reissue dec filed in accordance with MPEP 1414	1382_001RE_Reissue_Declaration_by_Assignee_v2_Signed.pdf	234872 d304ac7ac8fbcb35f46694f8ef6ce55f50b3fe7b	no	3
Warnings:					
Information:					
5	Assignee showing of ownership per 37 CFR 3.73	1382_001RE_Statement_under_3_73_c_Signed.pdf	123935 64ded00db8a3db267c365f66c7ba0e0f58f07334	no	2
Warnings:					
Information:					
6	Miscellaneous Incoming Letter	US7990842B2.pdf	127613 8149e093df16a153d88dd21fac762df2ab1b1a79	no	9
Warnings:					
Information:					

7		1382_001RE_prelim_amend_v2.pdf	76484 826bcfdc0cecf6aa992a96604d78ea8f6096 55c8	yes	12

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Applicant Arguments/Remarks Made in an Amendment	11	12
Claims	6	10
Specification	2	5
Preliminary Amendment	1	1

Warnings:					
Information:					
8	Consent of Assignee accompanying the declaration	1382_001RE_Consent_of_Assignee_Signed.pdf	116880 e951f0858db83237cf33bd30e16095cd799 a4203	no	1
Warnings:					
Information:					
9	Power of Attorney	1382_001RE_POA_Signed.pdf	74433 0f903f992fc307457a131b1624d69c6b7eb3 57cb	no	1
Warnings:					
Information:					
10	Fee Worksheet (SB06)	fee-info.pdf	37528 0779bc038f9102463015a95c4916f1628171 9408	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3113781		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/50 (10-17)
Approved for use through 01/31/2020. OMB 0651-0033
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REISSUE PATENT APPLICATION TRANSMITTAL

Address to:

Mail Stop Reissue
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Attorney Docket No.	1382.001RE
First Named Inventor	Jason Alexander Trachewsky
Original Patent Number	7,990,842
Original Patent Issue Date (Month/Day/Year)	08/02/2011
Priority Mail Express® Label No.	

APPLICATION FOR REISSUE OF: (*Check applicable box*) ☑ Utility Patent ☐ Design Patent ☐ Plant Patent

APPLICATION ELEMENTS (37 CFR 1.173)

1. ☑ **Fee Transmittal Form** (PTO/SB/56)
2. ☐ **Applicant asserts small entity status.** See 37 CFR 1.27
3. ☐ **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. ☑ **Specification and Claims** in double column copy of patent format (*amended, if appropriate*)
5. ☑ **Drawing(s)** (*proposed amendments, if appropriate*)
6. ☑ **Reissue Oath/Declaration or Substitute Statement** (37 CFR 1.175) (PTO/AIA/05, 06, or 07)
7. ☑ **Application Data Sheet** **NOTE:** Benefit claims under 37 CFR 1.78 and foreign priority claims under 37 CFR 1.55 MUST be set forth in an Application Data Sheet (ADS).
8. ☑ **Original U.S. Patent currently assigned?** ☑ Yes ☐ No (*If Yes, check applicable box(es)*)
   - ☑ Written Consent of all Assignees (PTO/AIA/53)
   - ☑ 37 CFR 3.73(c) Statement (PTO/AIA/96)
9. ☐ **CD-ROM or CD-R** in duplicate, Computer Program (*Appendix*) or large table
   - ☐ Landscape Table on CD
10. **Nucleotide and/or Amino Acid Sequence Submission** (*if applicable, items a. – c. are required*)
    - a. ☐ Computer Readable Form (CRF)
    - b. ☐ Specification Sequence Listing on:
      - i. ☐ CD-ROM (2 copies) or CD-R (2 copies); **or**
      - ii. ☐ Paper
    - c. ☐ Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

11. ☐ **Statement of status and support for all changes to the claims.** See 37 CFR 1.173(c).
12. ☑ **Power of Attorney**
13. ☐ **Information Disclosure Statement (IDS)** PTOSB/08 or PTO-1449
    - ☐ Copies of citations attached
14. ☐ **English translation of Reissue Oath/Declaration** (*if applicable*)
15. ☐ **Return Receipt Postcard** (MPEP § 503) (Should be specifically itemized)
16. ☑ **Preliminary Amendment** (37 CFR 1.173; MPEP § 1453)
17. ☑ **Other:** U.S. Patent No. 7,990,842

☐ This is a continuation reissue or divisional reissue application (*i.e.*, a second or subsequent reissue application for the same issued patent). (*Check box if applicable.*)

18. CORRESPONDENCE ADDRESS

☑ The address associated with Customer Number: 22186 **OR** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone			
Email					

Signature	/Steve Mendelsohn/	Date	11/18/2019
Name (Print/Type)	Steve Mendelsohn	Registration No.	35,951

This collection of information is required by 37 CFR 1.173. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop Reissue, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/SB/56 (03-13)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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REISSUE APPLICATION FEE TRANSMITTAL FORM

Docket Number (Optional): 1382.001RE

Application as Filed – Part 1

	(1) Claims in Patent	(2) Claims Filed in Reissue Application	(3) Number Extra	Micro Entity Rate ($)	Micro Entity Fee ($)	Small Entity Rate ($)	Small Entity Fee ($)	Undiscounted Rate ($)	Undiscounted Fee ($)
Total Claims (37 CFR 1.16(i))	(A) 20	(B) 25	* 5 =	x =		x =		x 100 =	500
Ind. Claims (37 CFR 1.16(h))	(C) 1	(D) 1	** 0 =	x =		x =		x 460 =	0
Application Size Fee (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $400 ($200 for small entity, $100 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).								
		Filing Fee (37 CFR 1.16(e))							300
		Search Fee (37 CFR 1.16(n))							660
		Examination Fee (37 CFR 1.16(r))							2200
		Total Filing Fee							3660

Application as Amended – Part 2

	(1) Claims Remaining After Amendment	(2) Highest Number Previously Paid For	(3) Extra Claims Present	Micro Entity Rate ($)	Micro Entity Fee ($)	Small Entity Rate ($)	Small Entity Fee ($)	Undiscounted Rate ($)	Undiscounted Fee ($)
Total Claims (37 CFR 1.16(i))	*** -	****	=	x =		x =		x =	
Ind. Claims (37 CFR 1.16(h))	*** -	*****	=	x =		x =		x =	
Application Size Fee (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $400 ($200 for small entity, $100 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).								
			Total Additional Fee						

* Enter (B) – 20, or enter "0" if (B) is less than 20.
** Enter (D) – minus 3, or enter "0" if (D) is less than 3.
*** After any cancellation of claims.
**** If the "Highest Number of Total Claims Previously Paid For" is less than 20, enter "20" in this space.
***** If the "Highest Number of Independent Claims Previously Paid For" is less than 3, enter "3" in this space.

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☑ The Director is hereby authorized to charge any additional fees under 37 CFR 1.16 or 1.17 which may be required, or credit any overpayment to Deposit Account No. 50-0782.

☐ A check in the amount of $ _____ to cover the filing/additional fee is enclosed.

☑ Payment made via EFS-Web.

☐ Payment by credit card. Form PTO-2038 is attached. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

/Steve Mendelsohn/
Signature

11/18/2019
Date

Steve Mendelsohn
Typed or Printed Name

35,951
Registration Number, if applicable

215-557-6657
Telephone Number

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11, 1.14 and 41.6. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	1382.001RE
	Application Number	
Title of Invention	Backward-Compatible Long Training Sequences for Wireless Communication Networks	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Jason	Alexander	Trachewsky	

Residence Information (Select One) ● US Residency Non US Residency Active US Military Service

City	State/Province	Country of Residence
Menlo Park	CA	US

Mailing Address of Inventor:

Address 1	127 Hillside Avenue
Address 2	
City	Menlo Park
State/Province	CA
Postal Code	94025
Country	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Rajendra	T.	Moorti	

Residence Information (Select One) ◉ US Residency Non US Residency Active US Military Service

City	State/Province	Country of Residence
Mountain View	CA	US

Mailing Address of Inventor:

Address 1	116 Eldora Drive
Address 2	
City	Mountain View
State/Province	CA
Postal Code	94041
Country	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	1382.001RE
	Application Number	
Title of Invention	Backward-Compatible Long Training Sequences for Wireless Communication Networks	

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	22186		
Email Address	steve@mendelip.com	Add Email	Remove Email

Application Information:

Title of the Invention	Backward-Compatible Long Training Sequences for Wireless Communication Networks		
Attorney Docket Number	1382.001RE	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	5	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	22186		

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	1382.001RE
	Application Number	
Title of Invention	Backward-Compatible Long Training Sequences for Wireless Communication Networks	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
	reissued of	12684650	2010-01-08	7990842	2011-08-02

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12684650	Continuation of	11188771	2005-07-26	7646703	2010-01-12

Prior Application Status: Expired — Remove

Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
11188771	Claims benefit of provisional	60634102	2004-12-08

Prior Application Status: Expired — Remove

Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
11188771	Claims benefit of provisional	60591104	2004-07-27

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. — Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. — Add

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	1382.001RE
	Application Number	
Title of Invention	Backward-Compatible Long Training Sequences for Wireless Communication Networks	

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	1382.001RE
	Application Number	
Title of Invention	Backward-Compatible Long Training Sequences for Wireless Communication Networks	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	1382.001RE
	Application Number	
Title of Invention	Backward-Compatible Long Training Sequences for Wireless Communication Networks	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 — Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Bell Northern Research, LLC		
Mailing Address Information For Applicant:			
Address 1	401 North Michigan Avenue		
Address 2			
City	Chicago	**State/Province**	IL
Country	US	Postal Code	60611
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	1382.001RE
	Application Number	
Title of Invention	Backward-Compatible Long Training Sequences for Wireless Communication Networks	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

Organization Name	Bell Northern Research, LLC

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	401 North Michigan Avenue		
Address 2			
City	Chicago	**State/Province**	IL
Country i	US	Postal Code	60611
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Steve Mendelsohn/			Date (YYYY-MM-DD)	2019-11-18
First Name	Steve	Last Name	Mendelsohn	Registration Number	35951

Additional Signature may be generated within this form by selecting the Add button. Add

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	1382.001RE
	Application Number	
Title of Invention	Backward-Compatible Long Training Sequences for Wireless Communication Networks	

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The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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REISSUE APPLICATION DECLARATION BY THE ASSIGNEE	Docket Number (optional) 1382.001RE

I hereby declare that:

The residence and mailing address of the inventor or joint inventors are stated below.

Name of the Assignee:

Bell Northern Research LLC

I am authorized to act on behalf of the assignee (if the assignee is a juristic entity).

The entire title to the patent identified below is vested in said assignee, or if there are multiple assignees/owners, all assignees/owners have executed a Reissue Application Declaration to account for the entire title of the patent identified below.

Inventor Jason Alexander Trachewsky

Residence: City	State	Country
Menlo Park	CA	US

Mailing Address

127 Hillside Avenue

City	State	Zip	Country
Menlo Park	CA	94025	US

☑ Additional Inventors are named on separately numbered sheets attached hereto.

Patent Number 7,990,842	Patent Issue Date August 2, 2011

I believe said inventor(s) to be the original inventor or original joint inventors of the subject matter which is described and claimed in said patent, for which a reissue patent is sought on the invention titled:

Backward-Compatible Long Training Sequences for Wireless Communication Networks

the specification of which

☑ is attached hereto.

☐ was filed on _____ as reissue application number _____.

The above-identified application was made or authorized to be made by me.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

I believe the original patent to be wholly or partly inoperative or invalid, for the reasons described below.
(Check all boxes that apply.)

☑ by reason of a defective specification or drawing.

☑ by reason of the patentee claiming more or less than he had the right to claim in the patent.

☐ by reason of other errors.

This collection of information is required by 37 CFR 1.175. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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REISSUE APPLICATION DECLARATION BY THE ASSIGNEE	Docket Number (Optional) 1382.001RE

At least one error upon which reissue is based is described below. If the reissue is a broadening reissue, a claim that the application seeks to broaden must be identified and the box below must be checked:

The specification as issued incorrectly describes (i) module 208 of FIG. 2 as a serial to parallel module and (ii) module 308 of FIG. 3 as a parallel to serial module. This reissue application amends the specification to correctly describe (i) module 208 as a parallel to serial module and (ii) module 308 as a serial to parallel module.

[Attach additional sheets, if needed.]

☐ **The application for the original patent was filed under 37 CFR 1.46 by the assignee of the entire interest.**

I hereby appoint:

☑ Practitioners associated with Customer Number: 22186

OR

☐ Practitioner(s) named below:

Name	Registration Number

as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith.

Correspondence Address: Direct all communications about the application to:

☑ The address associated with Customer Number: 22186

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

Signature	Afzal Dean	Date (Optional) Nov. 14, 2019
Legal name of person signing	Afzal Dean	
Address of Assignee	401 North Michigan Avenue, Chicago, IL 60611	

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. 1382.001RE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL SHEET OF REISSUE APPLICATION DECLARATION BY ASSIGNEE

Additional Inventor(s):

Name:	Rajendra T. Moorti
Residence:	Mountain View, CA, US
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PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Bell Northern Research, LLC

Application No./Patent No.: 7,990,842 Filed/Issue Date: 08/02/2011

Titled: Backward-Compatible Long Training Sequences for Wireless Communication Networks

Bell Northern Research, LLC, a limited liability corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Inventors To: BROADCOM CORPORATION

   The document was recorded in the United States Patent and Trademark Office at
   Reel 017568, Frame 0238, or for which a copy thereof is attached.

2. From: BROADCOM CORPORATION To: BELL NORTHERN RESEARCH, LLC

   The document was recorded in the United States Patent and Trademark Office at
   Reel 044886, Frame 0331, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
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STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

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The document was recorded in the United States Patent and Trademark Office at

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The document was recorded in the United States Patent and Trademark Office at

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6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Afzal Dean	Nov. 14, 2019
Signature	Date
Afzal Dean	President
Printed or Typed Name	Title or Registration Number

REMARKS/ARGUMENTS

Status of Claims

Claims 1, 4, and 8-30 are pending in the application. Claims 2, 3, and 5-7 are canceled, claims 1, 4, 10, 14, 16, and 19 are amended, and new claims 21-30 are added herein. This application is a narrowing reissue application. The Applicant submits that claims 1, 4, and 8-30 are supported by the originally filed specification. Entry of the above amendments is earnestly solicited. The Applicant hereby requests further examination and reconsideration of the application in view of the foregoing amendments and these remarks.

Support for Specification Changes

The Specification has been amended to correct both typographical errors and substantive errors. Support for the following amendments to correct substantive errors is found, for example, as follows:

Paragraph	Support
Column 2, line 29	Sub-carrier index 0 of FIG. 4
Column 2, line 59	FIG. 4
Column 3, line 4	FIG. 5
Column 4, line 19	Sub-carrier index 0 of FIG. 4
Column 4, line 30 (module 208)	Module 208 of FIG. 2
Column 4, line 30 (sub-carrier 0)	Sub-carrier index 0 of FIG. 4
Column 4, line 65	Module 308 of FIG. 3

Support for Claim Changes

Support for the amendments to claims 1, 4, 10, and 19 and for new claims 21-30 is found, for example, as follows:

Claim	Support
1	FIG. 4
4	Column 5, lines 16-29
10	FIG. 1
19	FIG. 4
21	Column 2, lines 8-16
22	Column 2, lines 24-27; column 4, lines 10-18; and FIG. 4
23	Claims 9, 10, 12, 13, 15, 17, 19, 20, and FIG. 1
24-30	FIG. 2

Fees

During the pendency of this application, the Commissioner for Patents is hereby authorized to charge payment of any filing fees for presentation of extra claims under 37 CFR 1.16 and any patent application processing fees under 37 CFR 1.17 or credit any overpayment to **Mendelsohn Dunleavy, P.C., Deposit Account No. 50-0782**.

The Commissioner for Patents is hereby authorized to treat any concurrent or future filing by the Applicant or action by the Office, requiring a petition for extension of time under 37 CFR ' 1.136 for its timely submission, as incorporating a petition for extension of time for the appropriate length of time, with authorization to charge **Mendelsohn Dunleavy, P.C., Deposit Account No. 50-0782** for the extension fee, if not otherwise submitted for the filing by the applicant or action by the Office.

Respectfully submitted,

Date: 11/18/2019
Customer No. 22186
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CLAIMS

1. (amended) A wireless communications device, comprising:

a signal generator that generates an extended long training sequence; and

an Inverse Fourier Transformer operatively coupled to the signal generator,

wherein the Inverse Fourier Transformer processes the extended long training sequence from the signal generator and provides an optimal extended long training sequence with a minimal peak-to-average ratio, and

wherein at least the optimal extended long training sequence is carried by a greater number of subcarriers than a legacy [standard] wireless networking protocol standard configuration for an Orthogonal Frequency Division Multiplexing scheme,

wherein the optimal extended long training sequence is carried by exactly 56 active sub-carriers, and

wherein the optimal extended long training sequence is represented by encodings for indexed sub-carriers -28 to +28 excluding indexed sub-carrier 0 as follows:

Sub-carrier	-28	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15
Encoding	+1	+1	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1
Sub-carrier	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
Encoding	+1	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1	+1
Sub-carrier	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Encoding	+1	-1	-1	+1	+1	-1	+1	-1	+1	-1	-1	-1	-1	-1
Sub-carrier	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Encoding	+1	+1	-1	-1	+1	-1	+1	-1	+1	+1	+1	+1	-1	-1

.

2-3. (canceled)

4. (amended) The wireless communications device according to claim [2,] 1, wherein the [optimal extended long training sequence has a minimum] minimal peak-to-average power ratio [of] is 3.6 dB.

5-7.

8. (original) The wireless communications device according to claim 1, wherein a binary phase shift key encoding is used for each sub-carrier above the +26 indexed sub-carrier and below the −26 indexed sub-carrier.

9. (original) The wireless communications device according to claim 1, wherein the Inverse Fourier Transformer comprises at least one of the following: an Inverse Fast Fourier Transformer and an Inverse Discrete Fourier Transformer.

10. (amended) The wireless communications device according to claim 1, wherein the wireless communications device comprises one or more of the following: a personal digital assistant, a laptop computer, a personal computer, a processor, a monitor, and a cellular phone.

11. (original) The wireless communications device according to claim 1, wherein the wireless communications device comprises a wireless mobile communications device.

12. (original) The wireless communications device according to claim 1, wherein the wireless communications device comprises one or more of the following: an access point and a base station.

13. (original) The wireless communications device according to claim 1, wherein the wireless communications device is backwards compatible with legacy wireless local area network devices.

14. (amended) The wireless communications device according to claim 1, wherein the optimal extended long training sequence is longer than a long training sequence used by a legacy wireless local area network device in accordance with [a] the legacy wireless networking protocol standard.

15. (original) The wireless communications device according to claim 14, wherein the legacy wireless local area network device uses the optimal extended long training sequence to estimate a carrier frequency offset even though the optimal extended long training sequence is longer than the long training sequence that is specified by the legacy wireless networking protocol standard.

16. (amended) The wireless communications device according to claim 15, wherein the long training sequence that is specified by the legacy wireless networking protocol standard is maintained in [the extended long training sequence or] the optimal extended long training sequence.

17. (original) The wireless communications device according to claim 1, wherein the wireless communications device decreases power back-off.

18. (original) The wireless communications device according to claim 1, wherein the wireless communications device registers with one or more of the following: an access point and a base station.

19. (amended) The wireless communications device according to claim 1, wherein [the extended long training sequence or] the optimal extended long training sequence is encoded using binary phase shift key encoding on each of the 56 active subcarriers.

20. (original) The wireless communications device according to claim 1, comprising:

a symbol mapper operatively coupled to the signal generator, wherein the symbol mapper receives coded bits and generates symbols for each of 64 subcarriers of an Orthogonal Frequency Division Multiplexing sequence.

21. (new) The wireless communications device according to claim 14, wherein the legacy wireless networking protocol standard for the Orthogonal Frequency Division Multiplexing scheme corresponds to exactly 52 active subcarriers.

22. (new) The wireless communications device according to claim 21, wherein, for a long training sequence of the legacy wireless networking protocol standard, the indexed sub-carrier 0 is set to zero and encodings for the indexed sub-carriers -26 to +26 excluding the indexed sub-carrier 0 are:

Sub-carrier	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14
Encoding	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1	+1
Sub-carrier	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
Encoding	+1	+1	-1	-1	+1	+1	-1	+1	-1	+1	+1	+1	+1

Sub-carrier	1	2	3	4	5	6	7	8	9	10	11	12	13
Encoding	+1	-1	-1	+1	+1	-1	+1	-1	+1	-1	-1	-1	-1
Sub-carrier	14	15	16	17	18	19	20	21	22	23	24	25	26
Encoding	-1	+1	+1	-1	-1	+1	-1	+1	-1	+1	+1	+1	+1

.

23. (new) The wireless communications device according to claim 22, wherein:

the Inverse Fourier Transformer comprises at least one of the following: an Inverse Fast Fourier Transformer and an Inverse Discrete Fourier Transformer;

the wireless communications device comprises one or more of the following: a personal digital assistant, a laptop computer, a personal computer, a cellular phone, an access point, a processor, a monitor, and a base station;

the wireless communications device is backwards compatible with the legacy wireless local area network device;

the legacy wireless local area network device uses the optimal extended long training sequence to estimate a carrier frequency offset even though the optimal extended long training sequence is longer than the long training sequence that is specified by the legacy wireless networking protocol standard;

the wireless communications device decreases power back-off;

the optimal extended long training sequence is encoded using binary phase shift key encoding on each of the 56 active subcarriers; and

the wireless communications device further comprises a symbol mapper operatively coupled to the signal generator, wherein the symbol mapper receives coded bits and generates symbols for each of 64 subcarriers of an Orthogonal Frequency Division Multiplexing sequence.

24. (new) The wireless communications device according to claim 1, wherein at least one output of the Inverse Fourier Transformer is operatively coupled to at least one digital-to-analog converter.

25. (new) The wireless communications device according to claim 1, wherein at least one output of the Inverse Fourier Transformer is operatively coupled to multiple digital-to-analog converters, each of which is coupled to a transmitter.

26. (new) The wireless communications device according to claim 1, wherein an input of the signal generator is operatively coupled to a frequency-domain windower.

27. (new) The wireless communications device according to claim 1, wherein an output of the Inverse Fourier Transformer is operatively coupled to a time-domain windower.

28. (new) The wireless communications device according to claim 27, wherein an output of the time-domain windower is operatively coupled to at least one digital-to-analog converter.

29. (new) The wireless communication device according to claim 1, wherein an output of the Inverse Fourier Transformer is operatively coupled to a digital transmit filter.

30. (new) The wireless communications device according to claim 1, wherein an output of the Inverse Fourier Transformer is operatively coupled to a parallel-to-serial convertor.

SPECIFICATION

- Amend paragraph beginning at column 1, line 8, as follows:

The present application is reissue application for U.S. Patent No. 7,990,842, which was a CONTINUATION of U.S. application Ser. No. 11/188,771, filed Jul. 26, 2005 and issued as U.S. Patent No. 7,646,703. Said U.S. application Ser. No. 11/188,771 makes reference to, claims priority to and claims benefit from U.S. Application No. 60/591,104, filed Jul. 27, 2004; and U.S. Application No. 60/634,102, filed Dec. 8, 2004. The above-identified applications are hereby incorporated herein by reference in their entirety.

- Amend paragraph beginning at column 2, line 29, as follows:

In 802.11a/802.11g, each data packet starts with a preamble which includes a short training sequence followed by a long training sequence. The short and long training sequences are used for synchronization between the sender and the receiver. The long training sequence of 802.11a and 802.11g is defined such that each of sub-carriers −26 to +26, except for the sub-carrier 0, has one BPSK [consellation] constellation point, either +1 or −1.

- Amend paragraph beginning at column 2, line 37, as follows:

There exists a need to create a long training sequence of minimum peak-to-average ratio that uses more sub-carriers without interfering with adjacent channels. The inventive long [trains] training sequence with a minimum peak-to-average power ratio should be usable by legacy devices in order to estimate channel impulse response and to estimate carrier frequency offset between a transmitter and a receiver.

- Amend paragraph beginning at column 2, line 59, as follows:

According to another aspect of the invention, there is provided a network device for generating an expanded long training sequence with a minimal peak-to-average ratio. The network device includes a signal generating circuit for generating the expanded long training sequence. The network device also includes an Inverse Fourier Transform for processing the expanded long training sequence from the signal generating circuit and producing an optimal

expanded long training sequence with a minimal peak-to-average ratio. The expanded long training sequence and the optimal expanded long training sequence are stored on [more than] 56 sub-carriers.

- Amend paragraph beginning at column 3, line 4, as follows:

According to another aspect of the invention, there is provided a network device for generating an expanded long training sequence with a minimal peak-to-average ratio. The network device includes a signal generating circuit for generating the expanded long training sequence. The network device also includes an Inverse Fourier Transform for processing the expanded long training sequence from the signal generating circuit and producing an optimal expanded long training sequence with a minimal peak-to-average ratio. The expanded long training sequence and the optimal expanded long training sequence are stored on [more than] 63 sub-carriers.

- Amend paragraph beginning at column 4, line 4, as follows:

The present invention provides an expanded long training sequence of minimum peak-to-average power ratio and thereby decreases power back-off. The inventive expanded long training sequence may be used by 802.11a or 802.11g devices for estimating the channel impulse response and by a receiver for estimating the carrier frequency offset between the transmitter clock and receiver clock. The inventive expanded long training sequence is usable by 802.11a or 802.11g systems only if the values at sub-carriers −26 to +26 are identical to those of the current long training sequence used in 802.11a and 802.11g systems. As such, the invention [utilized] <u>utilizes</u> the same +1 or −1 binary phase shift key (BPSK) encoding for each new sub-carrier and the long training sequence of 802.11a or 802.11g systems is maintained in the present invention.

- Amend paragraph beginning at column 4, line 19, as follows:

In a first embodiment of the invention, the expanded long training sequence is implemented in 56 active sub-carriers including sub-carriers −28 to +28 <u>except the 0-index sub-carrier which is set to 0</u>. In another embodiment, an expanded long training sequence is implemented using 63 active sub-carriers, i.e., all of the active sub-carriers (−32 to +31) except the 0-index sub-carrier which is set to 0. In both embodiments of the invention, orthogonality is

NXP - Exhibit 1004 - Page 420

not affected, since a 64-point orthogonal transform is used to generate the time-domain sequence. Additionally, the output of an autocorrelator for computing the carrier frequency offset is not affected by the extra sub-carriers.

- Amend paragraph beginning at column 4, line 30, as follows:

FIG. 2 illustrates a schematic block diagram of a processor that is configured to generate an expanded long training sequence. Processor 200 includes a symbol mapper 202, a frequency domain window 204, a signal generating circuit 205, an inverse fast Fourier transform (IFFT) module 206, a [serial to] parallel to serial module 208, a digital transmit filter and/or time domain window module 210, and digital to analog converters (D/A) 212. For an expanded long training sequence, symbol mapper 202 generates symbols from the coded bits for each of the 64 subcarriers of an OFDM sequence. Frequency domain window 204 applies a weighting factor on each subcarrier. Signal generating circuit 205 generates the expanded long training sequence and if 56 active sub-carriers are being used, signal generating circuit generates the expanded long training sequence and stores the expanded long training sequence in sub-carriers −28 to +28_ except the 0-index sub-carrier which is set to 0. If 63 active sub-carriers are being used, signal generating circuit generates the expanded long training sequence and stores the expanded long training sequence in sub-carriers −32 to +32 i.e., all of the active sub-carriers (−32 to +31) except the 0-index sub-carrier which is set to 0. The inventive long training sequence is inputted into an Inverse Fourier Transform 206. The invention uses the same +1 or −1 BPSK encoding for each new sub-carrier. Inverse Fourier Transform 206 may be an inverse Fast Fourier Transform (IFFT) or Inverse Discrete Fourier Transform (IFDT). Inverse Fourier Transform 206 processes the long training sequence from signal generating circuit 205 and thereafter produces an optimal expanded long training sequence with a minimal peak-to-average power ratio. The optimal expanded long training sequence may be used in either 56 active sub-carriers or 63 active subscribers. [Serial to parallel] Parallel to serial module 208 converts the [serial time domain] parallel signals from the Inverse Fourier Transform 206 into [parallel] serial time domain signals that are subsequently filtered and converted to analog signals via the D/A.

- Amend paragraph beginning at column 4, line 65, as follows:

FIG. 3 is a schematic block diagram of a processor that is configured to process an expanded long training sequence. Processor 300 includes a symbol demapper 302, a frequency domain window 304, a fast Fourier transform (FFT) module 306, a [parallel to] serial to parallel

NXP - Exhibit 1004 - Page 421

module 308, a digital receiver filter and/or time domain window module 310, and analog to digital converters (A/D) 312. A/D converters 312 convert the sequence into digital signals that are filtered via digital receiver filter 310. [Parallel to serial] Serial to parallel module 308 converts the digital time domain signals into a plurality of [serial time domain] signals[.] to be presented to the input of the FFT module 306 which converts [the serial time domain] these signals into frequency domain signals. Frequency domain window 304 applies a weighting factor on each frequency domain signal. Symbol demapper 302 generates the coded bits from each of the 64 subcarriers of an OFDM sequence received from the frequency domain window.

NXP - Exhibit 1004 - Page 422

CUSTOMER NO. 22186 *PATENT*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. 1382.001RE

In re application of: Jason Alexander Trachewsky and Rajendra T. Moorti

Serial No.:	TBD	Group Art Unit:	TBD
Filed:	TBD	Examiner:	TBD
		Phone No.:	TBD

For: Backward-Compatible Long Training Sequences for Wireless Communication Networks

PRELIMINARY AMENDMENT FOR REISSUE APPLICATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

Prior to examination, please amend the application as follows:

PTO/AIA/53 (09-12)
Approved for use through 08/31/2013. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

REISSUE APPLICATION: CONSENT OF ASSIGNEE; STATEMENT OF NON-ASSIGNMENT	Docket Number (Optional) 1382.001RE

This is part of the application for a reissue patent based on the original patent identified below.

Name of Patentee(s)

Jason Alexander Trachewsky and Rajendra T. Moorti

Patent Number	Date Patent Issued
7,990,842	August 2, 2011

Title of Invention

Backward-Compatible Long Training Sequesnces for Wireless Communication Networks

1. ☑ Filed herein is a statement under 37 CFR 3.73(c). (Form PTO/AIA/96)

2. ☐ Ownership of the patent is in the inventor(s), and no assignment of the patent is in effect.

One of boxes 1 or 2 above must be checked. If multiple assignees, complete this form for each assignee. If box 2 is checked, skip the next entry and go directly to "Name of Assignee."

The written consent of all assignees and inventors owning an undivided interest in the original patent is included in this application for reissue.

The assignee(s) owning an undivided interest in said original patent is/are Bell Northern Research LLC, and the assignee(s) consents to the accompanying application for reissue.

Name of assignee/inventor (if not assigned)

Signature	Date
Afzal Dean	Nov. 14, 2019

Typed or printed name and title of person signing for assignee (if assigned)

Afzal Dean, President

This collection of information is required by 37 CFR 1.172. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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US007990842B2

(12) **United States Patent**
Trachewsky et al.

(10) **Patent No.: US 7,990,842 B2**
(45) **Date of Patent: *Aug. 2, 2011**

(54) **BACKWARD-COMPATIBLE LONG TRAINING SEQUENCES FOR WIRELESS COMMUNICATION NETWORKS**

(75) Inventors: **Jason Alexander Trachewsky**, Menlo Park, CA (US); **Rajendra T. Moorti**, Mountain View, CA (US)

(73) Assignee: **Broadcom Corporation**, Irvine, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/684,650**

(22) Filed: **Jan. 8, 2010**

(65) **Prior Publication Data**

US 2010/0110876 A1 May 6, 2010

Related U.S. Application Data

(63) Continuation of application No. 11/188,771, filed on Jul. 26, 2005, now Pat. No. 7,646,703.

(60) Provisional application No. 60/591,104, filed on Jul. 27, 2004, provisional application No. 60/634,102, filed on Dec. 8, 2004.

(51) **Int. Cl.**
H04J 11/00 (2006.01)

(52) **U.S. Cl.** **370/208**; 370/210

(58) **Field of Classification Search** 370/208, 370/210

See application file for complete search history.

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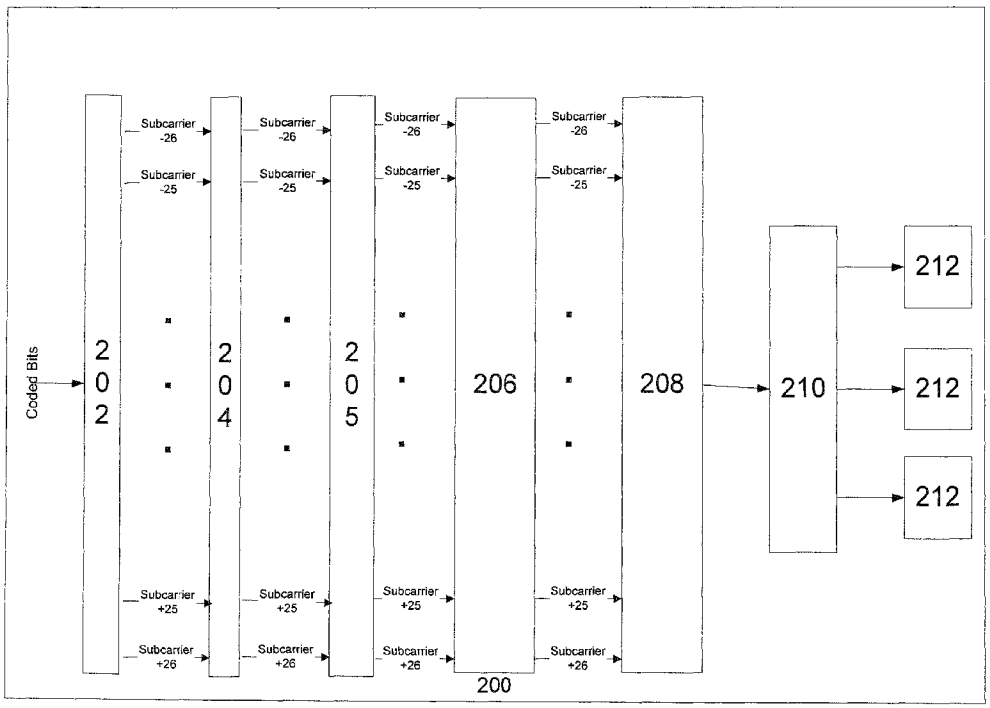
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(57) **ABSTRACT**

A network device for generating an expanded long training sequence with a minimal peak-to-average ratio. The network device includes a signal generating circuit for generating the expanded long training sequence. The network device also includes an Inverse Fourier Transform for processing the expanded long training sequence from the signal generating circuit and producing an optimal expanded long training sequence with a minimal peak-to-average ratio. The expanded long training sequence and the optimal expanded long training sequence are stored on more than 52 sub-carriers.

20 Claims, 5 Drawing Sheets



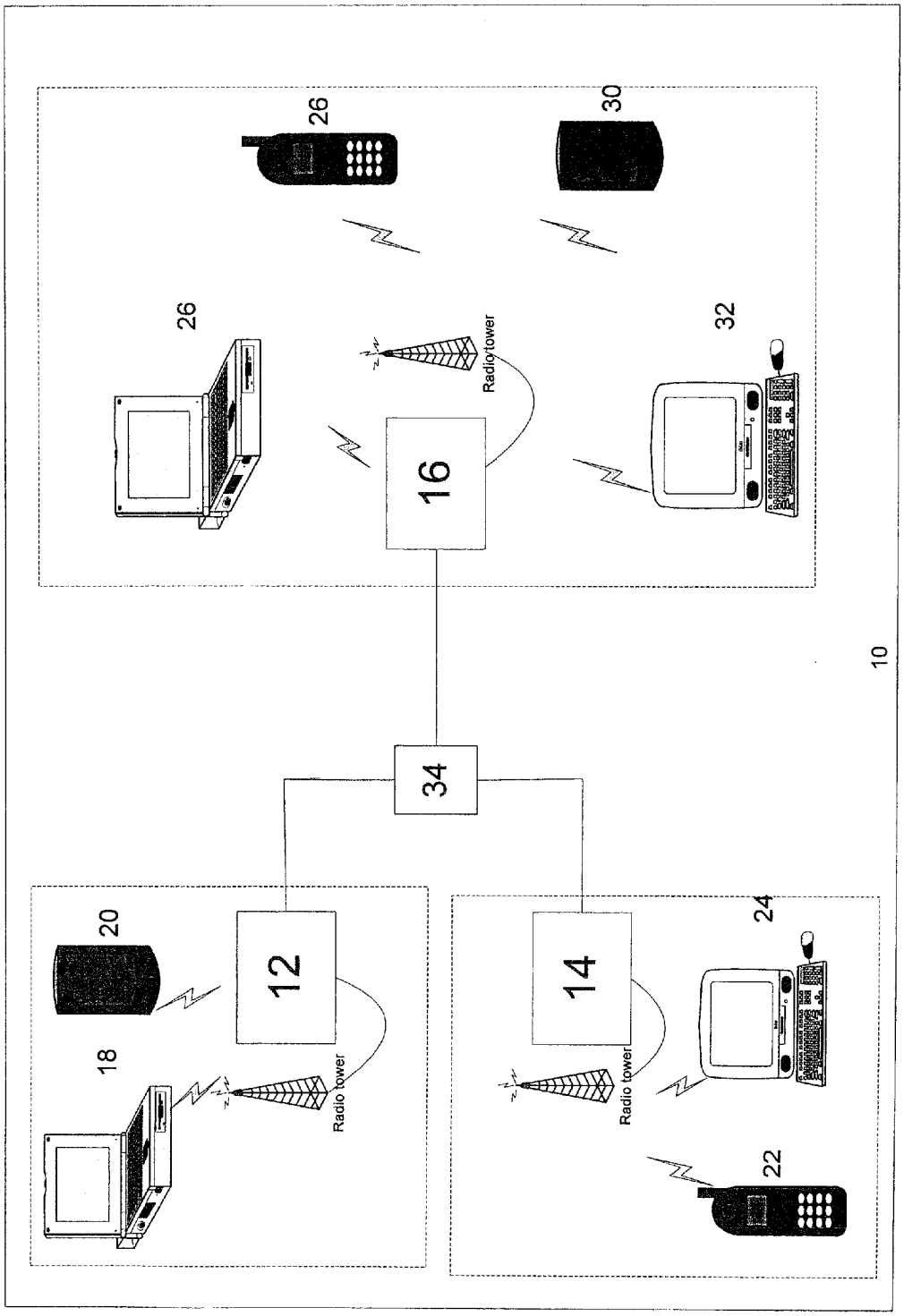

26
30
26
Radio tower
32
16
34
20
12
18
Radio tower
14
24
Radio tower
22
10

Figure 1

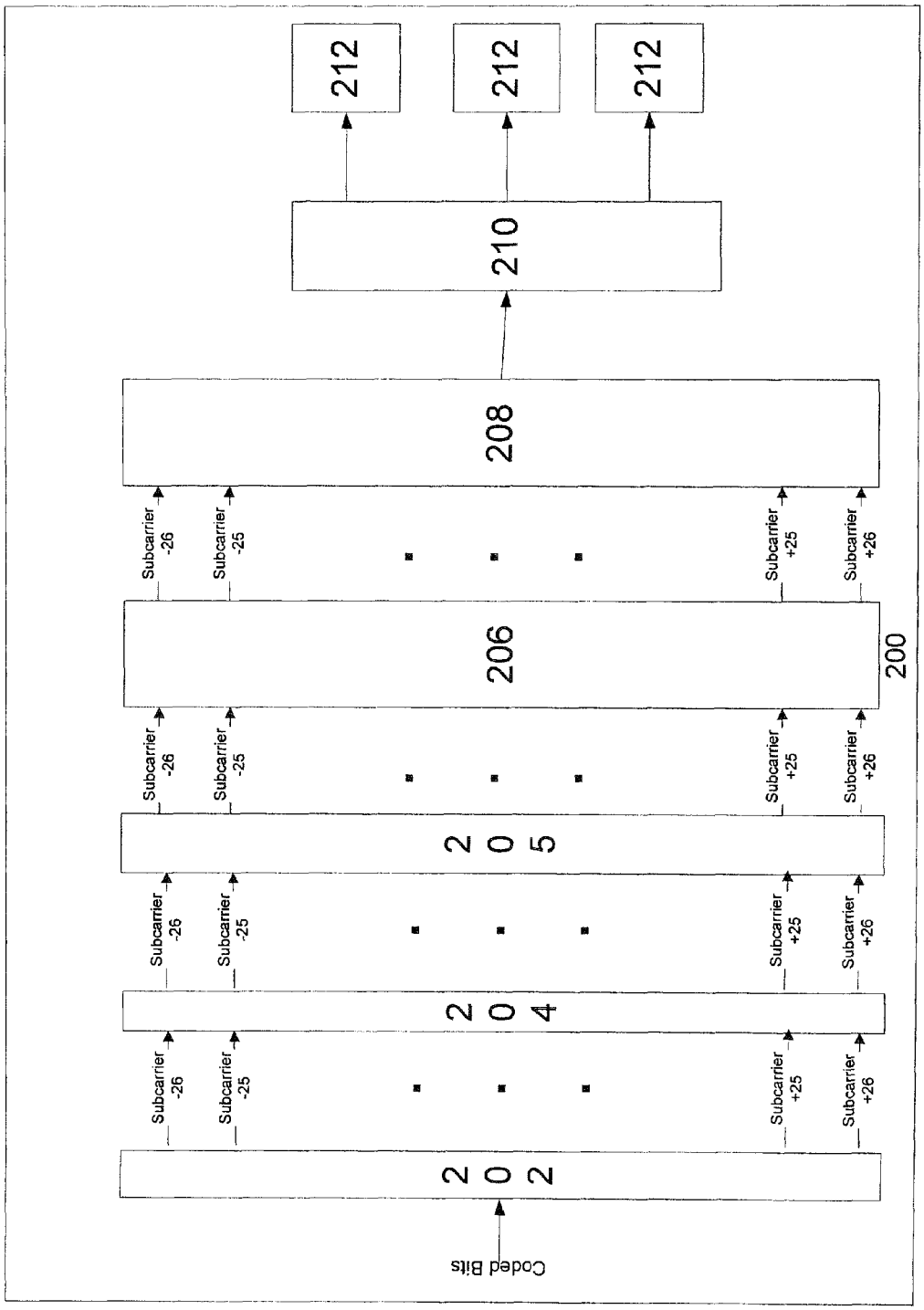

Coded Bits
202
204
205
206
208
210
212
212
212
Subcarrier -26
Subcarrier -25
Subcarrier +25
Subcarrier +26
200

Figure 2

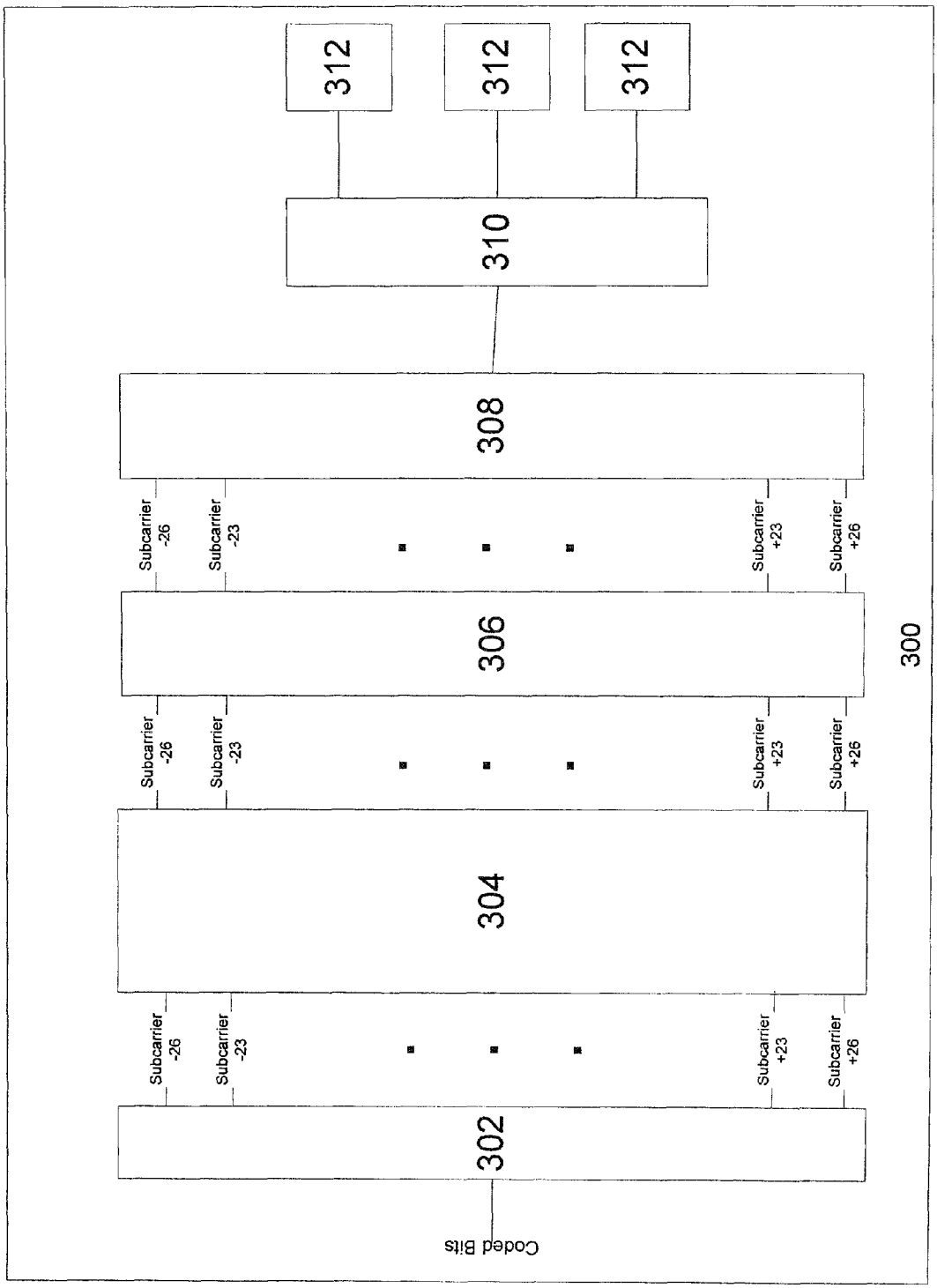

312
312
312
310
308
Subcarrier -26
Subcarrier -23
Subcarrier +23
Subcarrier +26
306
Subcarrier -26
Subcarrier -23
Subcarrier +23
Subcarrier +26
304
Subcarrier -26
Subcarrier -23
Subcarrier +23
Subcarrier +26
302
Coded Bits
300

Figure 3

+1	+1	1	1	-1	-1	1	1	-1	1	-1	1	1	1
-28	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15

Sub-carrier index

1	1	1	-1	-1	1	1	-1	1	-1	1	1	1	1	0
-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0

Sub-carrier index

+1	-1	-1	1	1	-1	1	-1	1	-1	-1	-1	-1	-1
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Sub-carrier index

1	1	-1	-1	1	-1	1	-1	1	1	1	1	-1	-1
15	16	17	18	19	20	21	22	23	24	25	26	27	28

Sub-carrier index

LONG TRAINING SEQUENCE FOR 56 ACTIVE
FIGURE 4

-1	-1	+1	+1	+1	+1	1	1	-1	-1	1	1	-1	1	-1	1	1	1
-32	-31	-30	-29	-28	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15

Sub-carrier index

1	1	1	-1	-1	1	1	-1	-1	1	1	-1	1	1	1	1	1	0
-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3

Sub-carrier index

+1	-1	-1	1	1	-1	1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Sub-carrier index

1	1	-1	-1	1	-1	1	-1	1	1	1	1	-1	-1	-1	-1	+1	-1
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

Sub-carrier index

LONG TRAINING SEQUENCE FOR 63 ACTIVE
FIGURE 5

BACKWARD-COMPATIBLE LONG TRAINING SEQUENCES FOR WIRELESS COMMUNICATION NETWORKS

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a CONTINUATION of U.S. application Ser. No. 11/188,771, filed Jul. 26, 2005. Said U.S. application Ser. No. 11/188,771 makes reference to, claims priority to and claims benefit from U.S. Application No. 60/591,104, filed Jul. 27, 2004; and U.S. Application No. 60/634,102, filed Dec. 8, 2004. The above-identified applications are hereby incorporated herein by reference in their entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to wireless communication systems and more particularly to long training sequences of minimum peak-to-average power ratio which may be used by legacy systems.

2. Description of the Related Art

Each wireless communication device participating in wireless communications includes a built-in radio transceiver (i.e., receiver and transmitter) or is coupled to an associated radio transceiver. As is known to those skilled in the art, the transmitter typically includes a data modulation stage, one or more intermediate frequency stages, and a power amplifier. The data modulation stage converts raw data into baseband signals in accordance with a particular wireless communication standard. The intermediate frequency stages mix the baseband signals with one or more local oscillations to produce RF signals. The power amplifier amplifies the RF signals prior to transmission via an antenna.

The receiver is typically coupled to the antenna and includes a low noise amplifier, one or more intermediate frequency stages, a filtering stage, and a data recovery stage. The low noise amplifier receives, via the antenna, inbound RF signals and amplifies the inbound RF signals. The intermediate frequency stages mix the amplified RF signals with one or more local oscillations to convert the amplified RF signal into baseband signals or intermediate frequency (IF) signals. The filtering stage filters the baseband signals or the IF signals to attenuate unwanted out of band signals to produce filtered signals. The data recovery stage recovers raw data from the filtered signals in accordance with a particular wireless communication standard.

Different wireless devices in a wireless communication system may be compliant with different standards or different variations of the same standard. For example, 802.11a an extension of the 802.11 standard, provides up to 54 Mbps in the 5 GHz band. 802.11b, another extension of the 802.11 standard, provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4 GHz band. 802.11g, another extension of the 802.11 standard, provides 20+ Mbps in the 2.4 GHz band. 802.11n, a new extension of 802.11, is being developed to address, among other thins, higher throughput and compatibility issues. An 802.11a compliant communications device may reside in the same WLAN as a device that is compliant with another 802.11 standard. When devices that are compliant with multiple versions of the 802.11 standard are in the same WLAN, the devices that are compliant with older versions are considered to be legacy devices. To ensure backward compatibility with legacy devices, specific mechanisms must be employed to insure that the legacy devices know when a device that is compliant with a newer version of the standard is using a wireless channel to avoid a collision. New implementations of wireless communication protocol enable higher speed throughput, while also enabling legacy devices which might be only compliant with 802.11a or 802.11g to communicate in systems which are operating at higher speeds.

Devices implementing both the 802.11a and 802.11g standards use an orthogonal frequency division multiplexing (OFDM) encoding scheme. OFDM is a frequency division multiplexing modulation technique for transmitting large amounts of digital data over a radio wave. OFDM works by spreading a single data stream over a band of sub-carriers, each of which is transmitted in parallel. In 802.11a and 802.11g compliant devices, only 52 of the 64 active sub-carriers are used. Four of the active sub-carriers are pilot sub-carriers that the system uses as a reference to disregard frequency or phase shifts of the signal during transmission. The remaining 48 sub-carriers provide separate wireless pathways for sending information in a parallel fashion. The 52 sub-carriers are modulated using binary or quadrature phase shift keying (BPSK/QPSK), 16 Quadrature Amplitude Modulation (QAM), or 64 QAM. Therefore, 802.11a and 802.11g compliant devices use sub-carriers −26 to +26, with the 0-index sub-carrier set to 0 and 0-index sub-carrier being the carrier frequency. As such, only part of the 20 Mhz bandwidth supported by 802.11a and 802.11g is use.

In 802.11a/802.11g, each data packet starts with a preamble which includes a short training sequence followed by a long training sequence. The short and long training sequences are used for synchronization between the sender and the receiver. The long training sequence of 802.11a and 802.11g is defined such that each of sub-carriers −26 to +26 has one BPSK consellation point, either +1 or −1.

There exists a need to create a long training sequence of minimum peak-to-average ratio that uses more sub-carriers without interfering with adjacent channels. The inventive long trains sequence with a minimum peak-to-average power ratio should be usable by legacy devices in order to estimate channel impulse response and to estimate carrier frequency offset between a transmitter and a receiver.

SUMMARY OF THE INVENTION

According to one aspect of the invention, there is provided a network device for generating an expanded long training sequence with a minimal peak-to-average ratio. The network device includes a signal generating circuit for generating the expanded long training sequence. The network device also includes an Inverse Fourier Transform for processing the expanded long training sequence from the signal generating circuit and producing an optimal expanded long training sequence with a minimal peak-to-average ratio. The expanded long training sequence and the optimal expanded long training sequence are stored on more than 52 sub-carriers.

According to another aspect of the invention, there is provided a network device for generating an expanded long training sequence with a minimal peak-to-average ratio. The network device includes a signal generating circuit for generating the expanded long training sequence. The network device also includes an Inverse Fourier Transform for processing the expanded long training sequence from the signal generating circuit and producing an optimal expanded long training sequence with a minimal peak-to-average ratio. The

expanded long training sequence and the optimal expanded long training sequence are stored on more than 56 sub-carriers.

According to another aspect of the invention, there is provided a network device for generating an expanded long training sequence with a minimal peak-to-average ratio. The network device includes a signal generating circuit for generating the expanded long training sequence. The network device also includes an Inverse Fourier Transform for processing the expanded long training sequence from the signal generating circuit and producing an optimal expanded long training sequence with a minimal peak-to-average ratio. The expanded long training sequence and the optimal expanded long training sequence are stored on more than 63 sub-carriers.

According to another aspect of the invention, there is provided a method for generating an expanded long training sequence with a minimal peak-to-average ratio. The method includes the steps of generating the expanded long training sequence and producing an optimal expanded long training sequence with a minimal peak-to-average ratio. The method also includes the step of storing the expanded long training sequence and the optimal expanded long training sequence on more than 52 sub-carriers.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention that together with the description serve to explain the principles of the invention, wherein:

FIG. **1** illustrates a communication system that includes a plurality of base stations, a plurality of wireless communication devices and a network hardware component;

FIG. **2** illustrates a schematic block diagram of a processor that is configured to generate an expanded long training sequence;

FIG. **3** is a schematic block diagram of a processor that is configured to process an expanded long training sequence;

FIG. **4** illustrates the long training sequence that is used in 56 active sub-carriers; and

FIG. **5** illustrates the long training sequence that is used in 63 active sub-carriers.

DETAILED DESCRIPTION OF THE INVENTION

Reference will now be made to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

FIG. **1** illustrates a communication system **10** that includes a plurality of base stations and/or access points **12-16**, a plurality of wireless communication devices **18-32** and a network hardware component **34**. Wireless communication devices **18-32** may be laptop computers **18** and **26**, personal digital assistant hosts **20** and **30**, personal computer **24** and **32** and/or cellular telephone **22** and **28**. Base stations or access points **12-16** are operably coupled to network hardware **34** via local area network connections **36**, **38** and **40**. Network hardware **34**, for example a router, a switch, a bridge, a modem, or a system controller, provides a wide area network connection for communication system **10**. Each of base stations or access points **12-16** has an associated antenna or antenna array to communicate with the wireless communication devices in its area. Typically, the wireless communication devices register with a particular base station or access point **12-14** to receive services from communication system **10**. Each wireless communication device includes a built-in radio or is coupled to an associated radio. The radio includes at least one radio frequency (RF) transmitter and at least one RF receiver.

The present invention provides an expanded long training sequence of minimum peak-to-average power ratio and thereby decreases power back-off. The inventive expanded long training sequence may be used by 802.11a or 802.11g devices for estimating the channel impulse response and by a receiver for estimating the carrier frequency offset between the transmitter clock and receiver clock. The inventive expanded long training sequence is usable by 802.11a or 802.11g systems only if the values at sub-carriers −26 to +26 are identical to those of the current long training sequence used in 802.11a and 802.11g systems. As such, the invention utilized the same +1 or −1 binary phase shift key (BPSK) encoding for each new sub-carrier and the long training sequence of 802.11a or 802.11g systems is maintained in the present invention.

In a first embodiment of the invention, the expanded long training sequence is implemented in 56 active sub-carriers including sub-carriers −28 to +28. In another embodiment, an expanded long training sequence is implemented using 63 active sub-carriers, i.e., all of the active sub-carriers (−32 to +31) except the 0-index sub-carrier which is set to 0. In both embodiments of the invention, orthogonality is not affected, since a 64-point orthogonal transform is used to generate the time-domain sequence. Additionally, the output of an auto-correlator for computing the carrier frequency offset is not affected by the extra sub-carriers.

FIG. **2** illustrates a schematic block diagram of a processor that is configured to generate an expanded long training sequence. Processor **200** includes a symbol mapper **202**, a frequency domain window **204**, a signal generating circuit **205**, an inverse fast Fourier transform (IFFT) module **206**, a serial to parallel module **208**, a digital transmit filter and/or time domain window module **210**, and digital to analog converters (D/A) **212**. For an expanded long training sequence, symbol mapper **202** generates symbols from the coded bits for each of the 64 subcarriers of an OFDM sequence. Frequency domain window **204** applies a weighting factor on each subcarrier. Signal generating circuit **205** generates the expanded long training sequence and if 56 active sub-carriers are being used, signal generating circuit generates the expanded long training sequence and stores the expanded long training sequence in sub-carriers −28 to +28. If 63 active sub-carriers are being used, signal generating circuit generates the expanded long training sequence and stores the expanded long training sequence in sub-carriers −32 to +32 i.e., all of the active sub-carriers (−32 to +31) except the 0-index sub-carrier which is set to 0. The inventive long training sequence is inputted into an Inverse Fourier Transform **206**. The invention uses the same +1 or −1 BPSK encoding for each new sub-carrier. Inverse Fourier Transform **206** may be an inverse Fast Fourier Transform (IFFT) or Inverse Discrete Fourier Transform (IFDT). Inverse Fourier Transform **206** processes the long training sequence from signal generating circuit **205** and thereafter produces an optimal expanded long training sequence with a minimal peak-to-average power ratio. The optimal expanded long training sequence may be used in either 56 active sub-carriers or 63 active subscribers. Serial to parallel module **208** converts the serial time domain signals into parallel time domain signals that are subsequently filtered and converted to analog signals via the D/A.

FIG. **3** is a schematic block diagram of a processor that is configured to process an expanded long training sequence. Processor **300** includes a symbol demapper **302**, a frequency

domain window **304**, a fast Fourier transform (FFT) module **306**, a parallel to serial module **308**, a digital receiver filter and/or time domain window module **310**, and analog to digital converters (A/D) **312**. A/D converters **312** convert the sequence into digital signals that are filtered via digital receiver filter **310**. Parallel to serial module **308** converts the digital time domain signals into a plurality of serial time domain signals. FFT module **306** converts the serial time domain signals into frequency domain signals. Frequency domain window **304** applies a weighting factor on each frequency domain signal. Symbol demapper **302** generates the coded bits from each of the 64 subcarriers of an OFDM sequence received from the frequency domain window.

FIG. **4** illustrates the long training sequence with a minimum peak-to-average power ratio that is used in 56 active sub-carriers. Out of the 16 possibilities for the four new sub-carrier positions, the sequence illustrated in FIG. **4** has the minimum peak-to-average power ratio, i.e., a peak-to-average power ratio of 3.6 dB.

FIG. **5** illustrates the long training sequence with a minimum peak-to-average power ratio that is used in 63 active sub-carriers. Out of the 2048 possibilities for the eleven new sub-carrier positions, the sequence illustrated in FIG. **5** has the minimum peak-to-average power ratio, i.e., a peak-to-average power ratio of 3.6 dB.

It should be appreciated by one skilled in art, that the present invention may be utilized in any device that implements the OFDM encoding scheme. The foregoing description has been directed to specific embodiments of this invention. It will be apparent, however, that other variations and modifications may be made to the described embodiments, with the attainment of some or all of their advantages. Therefore, it is the object of the appended claims to cover all such variations and modifications as come within the true spirit and scope of the invention.

What is claimed:

1. A wireless communications device, comprising:

a signal generator that generates an extended long training sequence; and

an Inverse Fourier Transformer operatively coupled to the signal generator,

wherein the Inverse Fourier Transformer processes the extended long training sequence from the signal generator and provides an optimal extended long training sequence with a minimal peak-to-average ratio, and

wherein at least the optimal extended long training sequence is carried by a greater number of subcarriers than a standard wireless networking configuration for an Orthogonal Frequency Division Multiplexing scheme.

2. The wireless communications device according to claim **1**, wherein at least the optimal extended long training sequence is carried by at least 56 active sub-carriers.

3. The wireless communications device according to claim **2**, wherein the at least 56 active sub-carriers correspond to at least indexed sub-carriers −28 to +28.

4. The wireless communications device according to claim **2**, wherein the optimal extended long training sequence has a minimum peak-to-average power ratio of 3.6 dB.

5. The wireless communications device according to claim **1**, wherein at least the optimal extended long training sequence is carried by at least 63 active sub-carriers.

6. The wireless communications device according to claim **5**, wherein the at least 63 active sub-carriers correspond to at least indexed sub-carriers −32 to +31.

7. The wireless communications device according to claim **5**, wherein the optimal extended long training sequence has a minimum peak-to-average power ratio of 3.6 dB.

8. The wireless communications device according to claim **1**, wherein a binary phase shift key encoding is used for each sub-carrier above the +26 indexed sub-carrier and below the −26 indexed sub-carrier.

9. The wireless communications device according to claim **1**, wherein the Inverse Fourier Transformer comprises at least one of the following: an Inverse Fast Fourier Transformer and an Inverse Discrete Fourier Transformer.

10. The wireless communications device according to claim **1**, wherein the wireless communications device comprises one or more of the following: a personal digital assistant, a laptop computer, a personal computer and a cellular phone.

11. The wireless communications device according to claim **1**, wherein the wireless communications device comprises a wireless mobile communications device.

12. The wireless communications device according to claim **1**, wherein the wireless communications device comprises one or more of the following: an access point and a base station.

13. The wireless communications device according to claim **1**, wherein the wireless communications device is backwards compatible with legacy wireless local area network devices.

14. The wireless communications device according to claim **1**, wherein the optimal extended long training sequence is longer than a long training sequence used by a legacy wireless local area network device in accordance with a legacy wireless networking protocol standard.

15. The wireless communications device according to claim **14**, wherein the legacy wireless local area network device uses the optimal extended long training sequence to estimate a carrier frequency offset even though the optimal extended long training sequence is longer than the long training sequence that is specified by the legacy wireless networking protocol standard.

16. The wireless communications device according to claim **15**, wherein the long training sequence that is specified by the legacy wireless networking protocol standard is maintained in the extended long training sequence or the optimal extended long training sequence.

17. The wireless communications device according to claim **1**, wherein the wireless communications device decreases power back-off.

18. The wireless communications device according to claim **1**, wherein the wireless communications device registers with one or more of the following: an access point and a base station.

19. The wireless communications device according to claim **1**, wherein the extended long training sequence or the optimal extended long training sequence is encoded using binary phase shift key encoding on each of the subcarriers.

20. The wireless communications device according to claim **1**, comprising:

a symbol mapper operatively coupled to the signal generator, wherein the symbol mapper receives coded bits and generates symbols for each of 64 subcarriers of an Orthogonal Frequency Division Multiplexing sequence.

* * * * *